ANALYZING THE CAUSES AND EFFECTS OF DELAY IN ADDIS ABABA CONDOMINIUM HOUSING ASPHALT ROAD CONSTRUCTION PROJECTS

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ANALYZING CAUSES AND EFFECTS OF DELAY IN ADDIS ABABA CONDOMINIUM HOUSING ASPHALT ROAD CONSTRUCTION PROJECTS

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Declaration

I hereby declare that this thesis entitled **''Analyzing Causes and Effects of Delay in Addis Ababa Condominium Housing Asphalt Road Construction Projects''** was composed by myself, with the guidance of my adviser, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted, in the whole or in part for any other degree or professional qualification. Parts of this work have been published in (state previous publications).

Name: Signature, Date:

Bayafers Abate _____

Statement of Certification

This is to certify that the thesis prepared by **Mr. Bayafers Abate Kebede** entitled **''Analyzing Causes and Effects of Delay in Addis Ababa Condominium Housing Asphalt Road Construction Projects''** and submitted in fulfilments of the requirement for the Degree of Master of Business Administration complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Examiner:_____ Signature, Date: _____

Thesis Adviser: Professor Belete Kbede Mebratu Signature, Date: _____

Thesis Co-Adviser:_____ Signature, Date: _____

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ABSTRACT

One of the most common problems in construction project delivery is delay. Projects can be delayed due to a number of reasons that may be due to the client, the contractor, consultants, or a third party and may occur early or later in the project development. Especially in Addis Ababa condominium housing asphalt road projects delayed up to 243% of its contractual time. The major aim of this research is to identify the major causes and effects of delays in condominium housing asphalt road projects in Addis Ababa. To get the desired result an intensive literature review and a questionnaire survey was used to find the perception of major parties participating in the implementation of the construction projects in the city. Based on literature review 61 causes categorized into four groups and five effects of delay were identified. The survey which was carried out through a questionnaire from 36 participants representing clients, contractors and consultants was collected and analyzed using statistical tools like bar charts; pie charts; percentages and Relative Importance Index (RII) for ranking. The findings show that the main critical factors that cause condominium housing asphalt road construction projects delays in Addis Ababa are: cash flow problems faced by the contractor, delay in delivering the site to the contractor, and inadequate early planning of the project. The study further revealed that the most frequent occurring types of effect of delay were found to be cost overrun and dispute. The finding indicated that contractor is the major source of causes of delay. Finally recommendations are forwarded based on the findings of the results.

Keywords: causes of delay, effects of delay and condominium housing asphalt road projects

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List of Abbreviations

AACRA	Addis Ababa City Roads Authority
AAWSA	Addis Ababa Water and Sewerage Authority
BOQ	Bill of Quantity
CIRC	Construction Industry Review Committee
CPM	Critical Path Method
EEPCo	Ethiopian Electric Power Corporation
EFY	Ethiopian Fiscal Year
EPRDF	Ethiopian People Revolutionary Democratic Front
GC	General Contractor
GTZ	German Technical Corporation
IHDP	Integrated Housing Development Programme
RII	Relative importance index
PMI	Project management Institute of India
WBS	Work Breakdown Schedule

CHAPTER ONE

1 INTRODUCTION

1.1 Background

Construction plays an important role in an economy of a country. After all; it produces and maintains the built environment. As it can be seen, the built environment consists of infrastructure, commercial and industrial buildings, and housing (Gruneberg, 1997). All around the world many construction projects face one of the biggest construction problems which is the delay. Delays differ from a country to another, from a construction project to another and from construction type or cost to another due to every project circumstances (Sullivan A, 1986).

For a nation that is pursuing development such as Ethiopia, the construction sector plays a big role in meeting the objectives. Creating infrastructure which accelerates socio-economic progress, without the sector is unthinkable. Constructing schools, health centers, hospitals, roads and dams has brought a great impact in human development. On the other hand, it is undeniable that the sector created job opportunities for thousands and contributed a lot in reducing poverty. Here, in the city and other towns, most migrant labour from rural part of the country is absorbed by the sector. The expansion of urbanization also supports the sub-sector in creating market (Woldegiorgis, 2016).

Especially in Addis, the city administration finance and economy bureau allocate the highest capital budget for Road construction sector per annum, which covers 18%-25% annual budget of the city.

Based on the Addis Ababa City Administration, housing development program highly demands the construction of access roads in order to facilitate the condominium houses construction process as well as the dwellers accessibility of roads to different parts of the city.

Delay is considered to be one of the common problems in the construction industry. Delays have a negative effect on projects in terms of performance, time and cost. Construction project delays have a debilitating effect on all parties (owner, contractor, and consultant) to a contract in terms of growth in adversarial relationships, distrust, litigation, arbitration, cash-flow problems, and a general feeling of apprehension towards each other (Fisk, 2002).

This study will try to analyze the main factors and sources that cause delay and the effect of the delays on the stakeholders of the housing asphalt road construction.

1.2 Condominium Housing Asphalt Road Construction Development in Addis Ababa

The history of the city's condominium road development also begins from the inception of the Integrated Housing Development Programme (IHDP) which is government-led and financed housing provision programme for low-and middle-income households in Ethiopia. The programme was launched in 2004 (1996 in the Ethiopian calendar). (UN-HABITAT, 2011)

Based on UN HABITAT report, German Technical Corporation (GTZ) commencing the design of the pilot condominium housing project in the neighborhood of Bole Geri. The pilot project consisted of 750 residential units along with office and commercial units.

GTZ managed the project on behalf of the city government and the project was extremely successful in terms of cost and time. (UN-HABITAT, 2011)

On early project sites, Bole Gerji, roads were the final element to be built so as to reduce damage to them by heavy machinery during condominium block construction. However, this created major delays in condominium completion and now road and other infrastructure is planned and implemented much earlier in the construction phase, concurrent with condominium block construction.

Since the construction of Gerji condominium housing road projects, the construction of access roads by AACRA and other basic facilities are incorporated in the housing development program. The provisions of these facilities add to the living quality of the new neighbourhoods and people have started to realize the contrast between their previous and new living environments, which is gradually modernized.

By employing different local and international contractors companies AACRA construct more than 65.1 km asphalt roads in an average of 30m width to link 20/80 and 40/60 condominium housing sites to different parts of the city's main roads. Lideta, Kuye Fiche, Yeka Abado, Gemo, Ehl Ngid, Ayat, Bulbula, Lafto, Crown, Tulu Dimtu, Kilinto, Senga Tera, Genet Menafesha, Sumit …etc condominium housing asphalt road projects were set to be finalized before transfer of condominiums to the winner.

The total length of road constructed in the city till the establishment of the authority in March 15, 1998 was 1,300km of which 900 km was gravel road and the remaining 400km was asphalt surfaced road. AACRA has done remarkable progress in the city roads expansion and upgrading in the last 18 years since its establishment. Today the city roads length reached 5,915km of which 2,616km asphalt1,433 gravel and 1,866km. The

road network coverage reached 22.16% compared with the developed area of the city. (Athourtiy, 2017)

1.3 Statement of the problem

Most of the road projects of Addis Ababa City are not completed within the original contract price and original contract time due to right of way, contractor and consultant week performance, poor design quality, lack of integrity among different stakeholders …etc.

Before identifying the causes of delay it has to be identified weather delay in condominium housing asphalt road projects exist or not. During desk study eleven condominium housing asphalt road projects were evaluated their original estimated completion time based on actual and revised completion date then calculated the rate of time delay (overrun) occurred.

Table 1.1 Contract time and Actual completed time of Addis Ababa condominium housing asphalt road projects.

No	Condominium asphalt Project Name	contract or name	Consultant name	Contract signing date	Original completion date	Actual Completed or revised completion Time (days)	Rate of Time Over run (%)
1	Yeka Abado 1,2 and 3	Aser/ Melkon	United consulting	20/03/2015	19/12/2015	12/03/2016	31%
2	Gelan 3	Ethio General	Best consulting	20/02/2014	20/02/2016	19/11/2016	37%
3	Bole Arabsa 1 and 2	Aser	Road Design consulting	22/02/2016	21/02/2017	02/03/2017	2%
4	Genet menafesha	Samson	Classic consulting	29/04/2015	25/12/2015	24/01/2017	165%

No	Condominium asphalt Project Name	contract or name	Consultant name	Contract signing date	Original completion date	Actual Completed or revised completion Time (days)	Rate of
5	Karaqore	Samson	Classic consulting	29/04/2015	25/12/2015	29/01/2017	167%
6	koyefche lot 1	Melkon	Best consulting	13/03/2015	21/12/2015	12/07/2017	201%
7	kilinto	Homa	Best consulting	13/03/2015	02/04/2018	30/09/2018	16%
8	Ehl Ngd	IFH	United consulting	15/05/2015	14/12/2016	26/08/2018	107%
9	Tulu dimtu lot 5,6 and 7 (asphalt road and canal)	IFH	Classic consulting	13/03/2015	16/04/2017	01/12/2018	78%
10	koyefche lot 2	Ethio General	United consulting	10/02/2017	31/03/2018	01/12/2018	59%
11	Yeka ayat 2 and 3 junction (Asphalt road and drainage)	Eshetu Lema	Best consulting	20/06/2016	13/01/2017	30/05/2018	243%

Source: AACRA 2009 EFY Report and Contract documnts

The rate of time delay (overrun) ranges from a minimum of 2% to the maximum of 243% of the contract time.

Tables 1.1 clearly show that, the time delay (overrun) who significantly high in condominium housing asphalt road projects of Addis Ababa. From the projects' completion report it was found that the main reasons for delay are right of way problem, design change, contractors' financial problem.

Prior and during construction period which is becoming a common practice that reflects the improper management in the road projects of the city. The employer and the contractors are not beneficial from this scenario and at large the end users of the road project.

Therefore, it is clear that stakeholders (client, contractor, consultant, condominium housing project office and end users) are not beneficial from the negative effects of delays. Thus, it is important to explore the extent of delay in condominium housing of asphalt road projects of Addis Ababa City and better understand their influences.

1.4 Research Questions

To address the research objectives, the researcher will focus on the following basic questions:

1. What are the major factors that cause delay in condominium housing asphalt road construction projects delivery in Addis Ababa?
2. Which are the causes of delay that occur frequently in their order of significance?
3. What are the effects of condominium asphalt road construction delay on stakeholders?
4. Which are the effects of delay that occur frequently in their order of significance?

1.5 Objectives of the study

1.5.1 General objective

The purpose of this research paper is to analyze the cause and effect of delay in Addis Ababa condominium housing asphalt road construction projects.

1.5.2 Specific objectives:-

- To analyze the major factor that causes delay in condominium housing asphalt road construction projects delivery in Addis Ababa.
- To rank the identified causes in their order of significance and frequency.

- To identify the effects of delay on the construction of condominium asphalt road projects.
- To rank the effect of condominium asphalt road construction delay on stakeholders.

1.6 Significance of the study

Generally the study is envisaged to provide valuable relevant information for all contracting parties based on the findings of the study on causes and effect of delay in the condominium asphalt road construction projects of Addis Ababa city. Particularly, this study will assist the major construction contract role players both employer (AACRA), and road contractors to identify the potential causes and effects at design and construction stages to minimize and control delay and its consequential impacts. The study will also lay the foundation for further research on the subject matter.

1.7 Scope of the study

AACRA construction activity is vast in nature, which involve many kinds of projects under it. So investigating the city's road construction projects as a whole will be costly and time consuming. Due to this, the project focuses only on those condominium housing asphalt road projects in Addis Ababa, which are currently on the hands of the client in 2010 EFY plan and held by local general contractors of grade one. The project focuses only on the analysis of the causes and effects of delay on those condominiums housing asphalt road projects entire Addis Ababa city.

1.8 Organization of the study

This research consists of five parts; the first one is the proposal for identifying and defining the problems and establishment of the objectives of the Study. The second part of the research includes literature review. Literatures of cause and effect of delay in road construction were reviewed. The third chapter of the research included a methodology of the thesis. The fourth part of the research includes result and discussion. In this phase the result of questionnaires analysis and desk results will be discussed. The last part of the research includes the summary, conclusion and recommendations.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1 Definition of Construction Delays

Delay is known as the most common, costly and risky problem encountered in construction project and that because of the overriding importance of time for both the owner in terms of performance and the contractor in terms of money, it is the source of frequent disputes and claims leading to arbitration, litigation and eventual abandonment of the total project scheme (Ahmed S.M, 1999)

There are a number of definitions for delay: to make something happen later than expected; to cause something to be performed later than planned; or to not act timely. Each of these definitions can describe a delay to an activity of work in a schedule. On construction projects, as well as on other projects where a schedule is being used to plan work, it is not uncommon for delays to occur. It is what is being delayed that determines if a Project or some other deadline, such as a milestone, will be completed late. (Theodore, 2009)

2.1.2 Types of Construction Delay

Generally, there are four basic ways to categorize delays: (Theodore, 2009)

1. Critical or noncritical
2. Excusable or non-excusable
3. Compensable or non-compensable
4. Concurrent or non-concurrent

1. Critical Versus Non critical Delays

In any analysis of delays to a Project, the primary focus is on delays that affect the progress of the entire Project (the Project end date or milestone date) or that are critical to the Project completion. However, many delays occur that do not delay the Project completion date or a milestone date. Delays that affect the Project completion, or in some cases a milestone date, are considered critical delays, and delays that do not affect the Project completion, or a milestone date, are non critical delays. The concept of "critical" delays emanates from Critical Path Method (CPM) scheduling. While the determination of a critical activity is a major element of CPM scheduling, all projects, regardless of the type of schedule, have "critical" activities. If these activities are delayed, the Project completion date or a milestone date will be delayed. In some contracts, the term "controlling item of work" will be used. Normally, this refers to critical activities or critical work (Theodore, 2009).

Regardless of the type of schedule used, all projects have a critical path—the path of activities that if delayed will delay the completion date. Determining which activities truly control the Project completion date depends on the following:

- The Project itself
- The Contractor's plan and schedule (particularly the critical path)
- The requirements of the Contract for sequence and phasing
- The physical constraints of the Project—how to build the job from a practical perspective

Regardless of how one analyzes a project and the schedule to find the delays, there is one overriding criterion: The analysis must accurately consider the contemporaneous information when the delays were occurring. “Contemporaneous information” refers to the daily reports, the schedule in effect, and any other job data available that show the circumstances at the time of the delays. Proper research and documentation eliminates the “but-fors” and any other hypotheses contrived to advance predisposed conclusions or desired results (Theodore, 2009)

2. Excusable versus Non excusable Delays

A. Excusable Delays

All delays are either excusable or no excusable. An excusable delay, in general, is a delay that is due to an unforeseeable event beyond the Contractor’s or the Subcontractor’s control.

As sited in Alaghbari,et.al, (2007) excusable delays are known as “force majeure” delays, and commonly called “acts of God” because they are not the responsibility or fault of any particular party. Most contracts allow for the contractor to obtain an extension of time for excusable delays, but not additional money. Normally, based on common general provisions in public agency specifications, delays resulting from the following events would be considered excusable:

- General labor strikes
- Fires
- Floods
- Acts of God
- Owner-directed changes

- Errors and omissions in the plans and specifications
- Differing site conditions or concealed conditions
- Unusually severe weather
- Intervention by outside agencies
- Lack of action by government bodies, such as building inspection

These conditions may be reasonably unforeseeable and not within the contractor's control. Before the analyst concludes that a delay is excusable based solely on the preceding definitions, he or she must refer to the construction Contract documents. Decisions concerning delays must be made within the context of the specific Contract. The Contract should clearly define the factors that are considered valid delays to the Project that justify time extensions to the Contract completion date. For example, some contracts may not allow for any time extensions caused by weather conditions, regardless of how unusual, unexpected, or severe (Alaghbari,et.al, 2007).

B. Non excusable Delays

Based on Theodore, (2009) non excusable delays are events that are within the Contractor's control or that are foreseeable. These are some examples of no excusable delays:

- Late performance of subcontractors
- Untimely performance by suppliers
- Faulty workmanship by the Contractor or Subcontractors
- A project-specific labor strike caused by either the contractor's unwillingness to meet with labor representatives or by unfair labor practices

Again, the contract is the controlling document that determines if a delay would be considered no excusable. For example, some contracts consider supplier delays excusable if the Contractor can prove that the materials were requisitioned or ordered in a timely manner, but the material could not be delivered due to circumstances beyond the control of the Contractor. Other contracts may not allow such delays. The Owner and the Designer or drafter of the Contract specifications must be sure the Contract documents are clear and unambiguous. Similarly, before signing the Contract, the Contractor should fully understand what the Contract defines as excusable and no excusable delays. (Theodore, 2009)

3. Compensable versus No compensable Delays

A compensable delay is a delay where the contractor is entitled to a time extension and to additional financial compensation. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. Non-compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay. Thus, the question of whether a delay is compensable must be answered. Additionally, a non-excusable delay warrants neither additional compensation nor a time extension (Theodore, 2009).

In addition to the compensable delays that result from contract changes by change notice, there are compensable delays that can arise in other ways. Such compensable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, stated or implied, in the contract. If the delay is compensable, then the contractor is entitled not

only to an extension of time but also to an adjustment for any increase in costs caused by the delay (Al-Gahtani and Mohan, 2007).

4. Concurrent Delays

If only one factor is delaying construction, it is usually fairly easy to calculate both the time and cost resulting from that single issue. A more complicated but also more typical situation is one in which more than one factor delays the project at the same time or in overlapping periods of time. These are called concurrent delays (Alaghbari, et al 2007).

According to Alwi, et al., (2002), (as cited in Abubeker, 2015) concurrent delays occur when both owner and the contractor are responsible for the delay. Generally, if the responsible parties of the delays are intertwined, neither the contractor can be held responsible for the delay (force to accelerate, or be liable for liquidated damages) nor can he recover the delay damages from the owner. Until the development of CPM schedule analysis, there was no reliable method to differentiate the impact of contractor caused delays from owner caused delays (Abubeker, 2015).

In analyzing concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated. The following guidelines for classifying these kinds of concurrent delays:

- If excusable and non-excusable delays occur concurrently, only a time extension is granted to the contractor;
- If excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to time extension, but not to damages; and

- If two excusable with compensation delays occur concurrently, the contractor is entitled to both time extension and damages. An example of a concurrent delay would be if the client failed to supply detailed designs for specified machine installations (excusable delay with compensation) while at the same time, the contractor who would have installed those machines was on strike (excusable delay without compensation). In this scenario, since both excusable with compensation and excusable without compensation delays are present, the contractor would be entitled to a time extension, but not to damages. (Theodore, 2009)

2.2 Empirical literature

Delays occur in every construction project and the significant of these delays varies considerably from project to project. Many scholars have studied the causes of construction project delay for the past few years and have identified some factors as the main causes of delay and the effect of the delay. Among numerous studies have been carried out internationally and in developing countries; the researcher sick to review related studies conducted in road construction delay's cause and effect in developing country like Ethiopia. The following findings of such studies have been reviewed for this research is some of prior studies on cause and effects of delay in different parts of the world.

2.2.1 Studies on Causes of Delay

Mansfield et al, (1994) identified 16 major factors that caused delays and cost overruns in Nigeria. A questionnaire survey was carried out with contractors, consultants and client organizations in Nigeria. They presented that the causes of delay and cost overruns in

Nigerian construction projects were attributed to finance and payment arrangements, poor contract management, shortages in materials, inaccurate estimation, and overall price fluctuations. (Mansfield N. R., 1994)

Assaf, S. A. and S. Al-Hejji, (2006) Conducted a time performance survey of different types of construction projects in Eastern Province of Saudi Arabia to determine the causes of delay and their importance according to each project participant (owner, consultant, and contractor). It was concluded that 70% of projects experience time overrun. The survey was conducted with 23 contractors, 19 consultant and 15 owners. They identified seventy-three (73) causes of delay and grouped them into nine classes during the research. The most common cause of delay identified by all three parties was "change order. The overall results are stated that the factor related to labor, contractor, project owner and consultant are in the highest rank. (Assaf, 2006)

Le-Hoai, et.al (2008) are Studied problems related to delays and cost overruns during construction phase and they identified that the cause for construction delays and cost overruns in overall context are poor site management and supervision, poor project management assistance, financial difficulties of owner, financial difficulties of contractor and design changes are the five most frequent, severe and important causes. (Le-Hoai, 2008)

Mezher T.M, and Tawil W (1998) Carried out a research to find out the causes of delaysin construction industry in Lebanon. A total of 64 causes of delays were identified through research in which client, contractor and consultant were undertaken the study. All three parties generally agreed on the ranking of the major categories of delay factors. Owners had more concerns with regard to financial issues, while contractors ranked

contractual relationships highest, and finally, consultants firms ranked project management highest. These causes were categorized in 10 main groups: materials, manpower, equipment, financing, changes, government relations, project management, site conditions, environment and contractual relationships. (Mezher, 1998)

Abdalla, M. Odeh and Hussien T. Battaineh (2000) identify the most important causes of delay in construction projects with traditional type contracts from the viewpoint of construction contractors and consultants. Results of their survey indicates that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and sub-contractors are among the top ten most important factors. (Abdalla, 2000)

Al-Momani, A. H (2000) conducted a quantitative analysis of construction delays by examining the records of 130 public building projects constructed in Jordan during the period of 1990-1997. The researcher presented regression models of the relationship between actual and planned project duration for different types of building facilities. The analysis also included the reported frequencies of time extensions for the different causes of delays. The researcher concluded that the main causes of delay in construction projects relate to designers, user changes, weather, site conditions, late deliveries, economic conditions, and increase in quantities. (Al-Momani, 2000)

Also, Odeh and Battaineh (2002) studied causes of construction delay in Jordan. In their study presents, results of the survey indicate that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision-making, improper planning, and subcontractors are among

the top ten most important factors. They classified the causes of delays into the following eight major groups:

A. **Client related factors:-** include finance and payments of completed work, owner interference, slow decision-making by owners, and unrealistic imposed contract duration;
B. **Contractor related factors:-** include subcontractors, site management, construction methods, improper planning, mistakes during construction, and inadequate contractor experience;
C. **Consultant related factor:-** include contract management, preparation and approval of drawings, quality assurance/control, and waiting time for approval of test and inspections;
D. **Material related factors:-** include quality of material and shortage in material;
E. **Labor related factors:-** include labor supply, labor productivity;
F. **Equipment related factors:-** equipment availability and failure;
G. **Contract related factor** include change orders, mistakes and discrepancies in contract documents, contractual relationship related factor include, major disputes and negotiations, inappropriate average organizational structure linking all parties to the project, and lack of communication between the parties; and
H. **External factors** include weather condition, regulatory changes and building code, problems with neighbours, and unforeseen ground conditions.

Long, et al. (2004), studied the problems in large construction projects in developing countries, a case study from Vietnam. They revealed that the problems could be grouped under five major factors; incompetent designers/contractors; poor estimation and change

management; social and technological issues; site related issues; and improper techniques and tools. (Long, 2004)

The study of Ashraf Samarah and Ghanim A. Bekr (2016) was carried out to determine the causes and effects of delay in the Public Construction Projects of Jordan. They have identified 55 delay causes distributed over four categories. Out of them top ten factors causing delays for public sector projects in Jordan were are: inadequate management and supervision by the contractor, client's changes of the design, inadequate planning and control by the contractor, using lowest bid that lead to low performance, changes in the extent of the project , errors in design and contract documents , progress payments are not made in time by the client, Rework due to mistakes during construction, Changes in the original design and Low level productivity. (Ashraf Samarah D. A., 2016)

Ghanim A. Bekr, (2015) studied the causes of delay in Iraq construction projects by identifying and ranking the delay factors. The critical factors found in Iraq construction projects were: security measures, government change of regulations and bureaucracy, official and non-official holidays, low performance of lowest bidder contractors in the government tendering system, design and changes by owner, design changes by consultants, delay in progress payments by the owner, problems with local community, owner’s lack of experience in construction and economic local and global conditions. (Bekr, 2015)

Werku Koshe and K. N. Jha (2016) study on delay of construction of public building projects in Ethiopia. The study sought the views of clients, consultants, and contractors on the relative importance of the factors that cause delays in building construction projects in Ethiopia. The study showed that all the three groups of respondents generally

agreed that out of a total of 88 factors the top ten influencing factors are: Contractor's financial difficulty, Escalation of materials price, Infective project planning and scheduling, Delay in progress payments for completed works, Lack of skilled professional in contractor organization, Fluctuating labors availability, Late delivery of materials, Low productivity of labor, Unqualified / inadequate experienced labor, Insufficient data collection and survey before design. The 88 factors were categorized into eight major groups and were ranked. The results show that clients, consultants, and contractors all agreed that the contractor group of delay factors was the most influential factor. Material related factors were considered the second most important factor causing delay in construction projects followed by Designer's related factors and Consultants/supervisors related factors. (Werku Koshe, 2016)

Biruk Zegeye (2008) identifies and investigates the key causes delay in completion time and their impacts on road construction projects in Addis Ababa. Using questionnaire survey, targeted on the main stakeholders in the sector, perception on 57 hypothesized causes of delay is identified. The 57 causes of delay are grouped under eight major categories or sub groups; material related, labor related, equipment related, finance related, contractor related client related, consultant related and external factor related cause of delays.

Based on the analysis he forwarded the following findings:

1. Out of all the eight main groups' contractor, consultant and financial related factors are the top three categories from the client's perspective for causing delay on the road projects. While contractors on the contrary made the client related factors the first followed by external and consultant related factor.

According to the consultants, the first contributor of delay is external/ environmental factor and the contractor and equipment related being the second and the third.

2. Every party has related the causes of project delay with other parties or external related causes. There is a relatively a strong agreement between the client and the contractors and equal agreement between the consultant and the contractor and the client and the consultant. All the parties have agreed on only on weighting the labor related factors.
3. On the analysis of the average results of the respondents, the consultant related factors become the first category that contributor of the causes of delay of the road projects. (Zegeye, 2008)

Siraw Yenesew (2014) studied the Factors Contributing to time overruns on Road Construction Project sunder Addis Ababa City Administration and showed possible causes of delay as internal and external, financial and non-financial. Construction delay problem in the capital city of Ethiopia was studied by slow cite clearance, contractors financial problems, Inflation, exchange rate fluctuation, supply of material, inadequate contractors experience, low productivity of labor, inaccurate cost estimation, poor resource management, improper planning. (Yenesew, 2014)

The literatures sited above have identified the causes of delay by categorizing factors in groups without differentiating across project lifecycle. Even if this research paper focuses on the finding of the causes of delays at execution and closing or commissioning phase it is vital to know the causes of delays at all stage of the project life cycle. Project management Institute of India PMI (2012) in their survey of the reasons for time and cost

overruns across various infrastructural projects running across the country have mentioned both internal and external causes of delay through four project life cycle. The following are causes of delays at the different stages (KPMG India, 2013)

A. Pre-planning stage

- ✓ Delay in regulatory approvals (external)
- ✓ Unavailability/delayed availability of funds (external)
- ✓ Land/site handover (external)
- ✓ Lack of project managers/commercial managers with adequate planning skills (internal)
- ✓ Lack of Liasioning officer/Planning engineer (internal)
- ✓ Lack of cost managers (internal)
- ✓ Lack of safety officers/environmental practitioners (internal)

B. Planning and design stage

- ✓ Lack of strong R&R policies (external)
- ✓ Ineffective procurement planning (external)
- ✓ Design/scope change (external)
- ✓ Delay in regulatory approvals (external)
- ✓ Delay in decision making (external)
- ✓ Lack of planning engineer/commercial managers (internal)
- ✓ Lack of liasion officer or planning engineer (internal)
- ✓ Lack of MEP engineers (internal)
- ✓ High cost of environmental protection (internal)
- ✓ Scope creep and inadequate Detailed Project Report (DPR)

C. execution and monitoring

- ✓ Weak/ineffective project planning & monitoring (external)
- ✓ Contractual disputes (external)
- ✓ Unavailability/delayed availability of funds (external)
- ✓ Lack of strong R&R policies (external)
- ✓ Delay land/site handover (external)
- ✓ Material price escalation beyond projection (external)
- ✓ Escalation in labour costs (external)
- ✓ Incremental financial cost like change in foreign exchange rate, inflation, interest rate change (external)
- ✓ Lack of project managers/site managers/planning engineers/quantity supervisors (internal)
- ✓ Lack of awareness modern equipment &technology (internal)
- ✓ Lack of liason officer and commercial officers (internal)
- ✓ In effective utilization of labour (internal)
- ✓ Design change wrong poor selection of technology or equipment (internal)

D. Closure and handover

- ✓ Pre-commissioning teething troubles (external)
- ✓ Contractual disputes (external)
- ✓ Lack of commissioning, project and site managers, audit and total quality management professionals (internal)

2.2.2 Studies on Effects of Delay

A research work carried out by Aibinu and Jagboro (2002) on the effects of construction delays in Nigerian construction industry; reveals six effects of delay on project performance. These effects are time and cost overruns, disputes, arbitration, litigation and total abandonment.

In another study carried out in Malaysia by M. Sambasivan, andY. Soon (2007), found the same effect of delays in Malaysian construction industry. (M. Sambasivan, 2007)

In Pakistan, a study carried out by M. Haseeb, et.al. (2011) concentrated the effect of delay in the construction industry. Their study revealed that the clash, claims, total abandonment and slowing down the growth of the construction industry. (M. Haseeb, 2011, pp. 41-50)

Based on a research work of Ashraf Samarah, and Ghanim A. Bekr (2016) in titled 'Causes and Effects of Delay in Public Construction Projects in Jordan' they revealed that the delay of projects will cause time overrun, cost overrun, disputes, arbitration, litigation and total abandonment depend on frequency of occurrence. (Ashraf Samarah G. A., 2016)

Biruk Zegeye (2008), studied Cause and Effects of Delay on Road Construction Projects in Addis Ababa. The effects of delay have been ranked according to the frequency of their occurrence and the result have showed that the three most frequently occur effects are time overrun, cost overrun and dispute. (Zegeye, 2008)

2.2.3 Causes of Delay

The proneness of projects to delay has attracted the attention of researchers all over the world. Most of who tried to identify the immediate as well as the root causes of project

delay. A common theme from these is that project uncertainty and complexity provide a major challenge to the cost management capabilities of both parties and their professional advisers as well. (Ndekugri I, 2007)

He further stated the delay on any project is inevitable. From the contractor's perspectives, delay can cause inefficiency in the carrying out of the works and/ or cost escalations. Inefficiency often arises from the contractor being compelled to abandon carefully designed work plan for less efficient work methods thereby incurring additional cost, thus reducing profitability.

Ndekugri I, (2007) Observed that delay is equally a major financial risk to the employer. If the economic viability of the overall commercial venture depends generating an income stream from a particular date, failure to complete the construction project by the date could turn a profitable venture into a loss making one. Even though the delay does not cause losses but it reduces profitability on account of delay in the inception of revenue generation.

Table 2.1 trays to summarize major causes of delays as identified by previous researchers by some modification making (Akinsulire, 2008)

Table 2.1 Major causes of delays as identified by previous researchers

No	Researcher	Country of Study	Major causes of delay
1	Baldwin and Manthei (1977)	United States	1. Inclement weather 2. Subcontracting systems **3.** Shortages of labour supply
2	Arditi, Akan and Gurdarmar (1985)	Turkey	1. Considerable additional work 2. Delay in design work 3. Financial difficulties faced by public agencies and contractor 4. Frequent change orders / design 5. Organizational deficiencies 6. Shortages of resources

No	Researcher	Country of Study	Major causes of delay
3	Okpala and Aniekwu (1988)	Nigeria	1. Failure to pay for completed works 2. Poor contract management 3. Shortages of materials
4	Dlakwa and Culpin (1990)	Nigeria	4. Delay in payment to contractors 5. Fluctuations in materials, labour and plant costs
5	Mansfield, Ugwu and Doran (1994)	Nigeria	1. Fluctuations in costs 2. Improper financial and payment arrangements 3. Inaccurate cost estimates 4. Poor contract management 5. Shortages of materials
6	Semple, Hartman and Jergeas (1994)	Canada	6. Increases in the scope of work 7. Inclement weather 8. Restricted access
7	Assaf, Al-Khalim and Al-Hazmi (1995)	Saudi-Arabia	1. Changes in design / design errors 2. Delay in payment to contractors 3. Poor workmanship 4. Shortages of labour supply 5. Slow preparation and approval of shop drawing
8	Chan and Kumaraswamy (1996)	Hong Kong	1. Client- initiated variation 2. Poor site management and supervision 3. Slow decision making by project team 4. Unforeseen site conditions
9	Ogunlana and Promkuntong (1996)	Thailand	1. Changes in design / design errors 2. Liaisons problems among the contracting parties 3. Shortages of materials
10	Odeyinka and Yusif (1997)	Nigeria	1. Variation in orders. 2. Slow decision making. 3. Financial/Cash flow difficulties 4. Resources management problems 5. Planning and Scheduling problems 6. Inadequate site inspection 7. Inclement weather and acts of nature 8. Labour disputes and strikes
11	Mezhel and Tawil (1998)	Lebanon	1. Material shortages and changes in type and specification during construction 2. Skilled and Unskilled labour shortages and Poor productivity. 3. Shortages of equipment, unskilled operators, slow maintenance and old equipment. 4. Cash flow during construction, Delay in contractors' progress payment by owners, contractor financing problems and varying material costs. 5. Design changes by owners, design errors by consultants, geographical problems and unexpected site conditions 6. Permits from municipals, permits for foreign expatriates, building codes, bureaucracy in government agencies and urban planning permits. 7. Shop drawings, preparation of network scheduling, lack of personnel training & management support, poor judgment in estimating time and resources and poor initial site planning.

No	Researcher	Country of Residence	Major causes of delay
12	Al-Khali and Al-Ghaftly (1999)	Saudi Arabia	1. Cash flow problem / financial difficulties 2. Difficulties in obtaining permits 3. " Lowest bid wins" system
13	Al-Momami (2000)	Jordan	1. Change orders/ design 2. Inclement weather 3. Late delivery 4. Poor design 5. Unforeseen site conditions
14	Frimpong, Oluwoye and Crawford (2003)	Ghana	1. Monthly payment difficulties from agencies 2. Poor contractor management 3. Material procurement 4. Poor technical performance 5. Escalation of material prices
15	Lo, Fung and Tung (2006)	Hong Kong	1. Exceptionally low bid 2. Inadequate resources due to contractor/ lack of capital 3. Inexperienced contractors 4. Poor site management and supervision by consultants 5. Unforeseen ground conditions 6. Works in conflict with existing utilities
16	Biruk Zegeye (2008)	Addis Ababa	1. consultants, 2. external or environmental related factors and 3. clients
17	Siraw Yenesew, (2014)	Addis Ababa	1. slow cite clearance, 2. contractors financial problems, 3. Inflation, 4. exchange rate fluctuation, 5. supply of material, 6. inadequate contractors experience, 7. low productivity of labor, 8. inaccurate cost estimation, 9. poor resource management, 10. improper planning
18	Ghanim A. Bekr, (2015)	Iraq	1. security measures, 2. government change of regulations and bureaucracy, 3. official and non-official holidays, 4. low performance of lowest bidder contractors in the government tendering system, 5. design and changes by owner, 6. design changes by consultants, 7. delay in progress payments by the owner, 8. problems with local community, 9. owner's lack of experience in construction and economic local and global conditions.

No	Researcher	Country of Residence	Major causes of delay
19	Ashraf Samarah and Ghanim A. Bekr (2016)	Jordan	1. inadequate management and supervision by the contractor, 2. client's changes of the design, 3. inadequate planning and control by the contractor, 4. using lowest bid that lead to low performance, 5. changes in the extent of the project , 6. errors in design and contract documents , 7. progress payments are not made in time by the client, 8. Rework due to mistakes during construction, 9. Changes in the original design and 10. Low level productivity
20	Werku Koshe and K. N. Jha (2016)	Ethiopia	1. Contractor's financial difficulty 2. Escalation of materials price 3. Infective project planning and scheduling 4. Delay in progress payments for completed works 5. Lack of skilled professional in contractor organization, 6. Fluctuating labors availability, 7. Late delivery of materials, 8. Low productivity of labor, 9. Unqualified / inadequate experienced labor, 10. Insufficient data collection and survey before design.

2.2.4 Delay mitigation Measures

Based on CIRC report (2001), the major causes of delay can thus be summarized together with the corresponding mitigation measures below cited in (Henry, 2001).

Table 2.2: Major causes of delays and their corresponding mitigation measures

No	Major causes of delay	Sources of delay	Corresponding mitigation measures
1	" Lowest bid wins" system	Project	Client to reject low bids which have not been taken proper account of the risk involved and make sure adequate provisions have been allowed for in the tender prices for the fulfilment of statutory and contractual responsibilities
2	Change orders/ design (Variation)	Client	Client to exercise robust change control with particular emphasis on comprehensive project planning and risk assessment at project onset
3	Delay in design work	Design	Clients to ensure appropriate allocation of responsibilities among project participants and to enforce a clear accountability structure within their own organization
4	Inaccurate cost estimates	Design	To introduce past performance as one of the quality criteria for prequalification and bid assessment for public works consultancies, and develop a quantitative means for measuring the past performance of consultants

No	Major causes of delay	Sources of delay	Corresponding mitigation measures
5	In experienced contractors	Contractor	To improve the "Contractor system" for public projects and the Works Bureau to consider allowing those with consistently good performance to take part in the pre-qualification exercise for major public works projects
6	Late delivery	Project	Facilitate better integration in the delivery of construction project through wider option of alternative procurement approaches (e.g. design and build, prime contracting) in both the public and private sectors
7	Liaisons problems among the contracting parties	Contractor	To improve the "Contractor system" for public projects and the Works Bureau to consider allowing those with consistently good performance to take part in the pre-qualification exercise for major public works projects
8	Poor site/ contract management and supervision	Contractor / Consultants	Client to rigorously enforce acceptance standards and consider designated site supervision proposals as a critical criterion for tender evaluation. For consultants-managed projects, clients to require consultants to demonstrate that they have satisfactorily carried out their supervisory role in all project activities.
9	Poor workmanship	Contractor	Client organization to provide wider use of direct labour through contractual requirements
10	Shortages of resources	Resources	To develop an effective disciplinary mechanism to tackle non-performance by sharing information among Clients on the performance of their consultants and contractors
11	Slow decision making by project team	Consultants	Client and project team to secure teamwork, good practice and commitment from all parties at a project level through a jointly developed project pact
12	Slow preparation and approval of shop drawing	Client/Consultant/ Contractor	Client to ensure more integrated input from different disciplines
13	Subcontracting systems	Contractor	Client to prohibit total sub-letting and exercise tighter control over the performance and management of sub-contractors
14	Unforeseen ground /site conditions	Project	To reconsider the recommendation of the consultancy study on the General Condition of Contract for Public Works Projects with the objective of achieving a more equitable allocation of risks between contracting parties.
15	Works in conflict With existing utilities	Project	Appropriate department to take the lead in developing an efficient system to facilitate access to information on existing and proposed utilities to contractors and project proponents.

However Assaf and Al-Hejji (2006) recommend measures to all parties in order to minimize and control delays in construction projects: He classified them into Clients, Contractors and Consultants: (Assaf, 2006)

Table 2.3 Delays reduction measures

No	Categories	Reduction measures suggested
1	Client	• Pay progress payment to the contractor on time because it impairs the contractors' ability to finance the work. • Minimize change orders during construction to avoid delays. • Avoid delay in reviewing and approving of design documents than the anticipated. • Check for resources and capabilities, before awarding the contract to the lowest bidder
2	Contractor	• Shortage and low productivity of labor: enough number of labours should be assigned and be motivated to improve productivity. • Financial and cash flow problems: contractor should manage his financial resources and plan cash flow by utilizing progress payment • Planning and scheduling: they are continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes. • Site management and supervision: administrative and technical staff should be assigned as soon as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost
3	Consultants	• Reviewing and approving design documents: any delay caused by the consultant engineer in checking, reviewing and approving the design submittals prior to construction phase, could delay the progress of the work; • Inflexibility: Consultants should be flexible in evaluating contractor works. Compromising between the cost and high quality should be considered. • Producing design documents on time: A/E should set a schedule to complete design documents on time, otherwise result in a delay of work completion. • Mistakes and discrepancies in design documents: They are common reasons for redoing designs and drawings and may take a long time to make necessary corrections.

2.2.5 Effects of Delay

Many articles and studies conducted recently on the effect of delay on project delivery, both locally and internationally have been reviewed. Surveys conducted by Kaming, Olomolaiye, Holt and Harris studied influencing factors on 31 high-rise projects in Indonesia and found out that cost overruns occur more frequently and are more severe problem than time overruns. They pointed out that the major factors influencing cost overrun are material cost increase due to inflation, inaccurate material estimation and degree of complexity. (Kaming P.F, 1997)

Aibinu and Jagboro however identified six effects of delay which are: (Jagoro, 2002)

1. Time overruns
2. Cost overruns
3. Dispute
4. Arbitration
5. Total abandonment
6. Litigation.

Soon and Sambasivan further elaborated on the effects of delay as suggested by Aibinu and Jagboro that: (Sambasivan., 2007)

1. **Time overruns: -** Client – related and contractor – related factors have greater impact on the time overruns. Factors such as inadequate planning by the contractors, improper site management by contractors, inadequate project handling experience of contractors and delay in the payments for the work completed directly affect the completion of the project and cause time overrun.
2. **Cost overruns:-** Contract – related factors such as change orders, mistakes and discrepancies in the contract document will definitely result in cost overrun and in most cases time related overruns will lead to cost overrun.
3. **Dispute:-** Client –related, contract- related, contractual related and external factors will have imparts on disputes that arise during the course of the project. Factors such as delay in the payment of completed work, frequent owner interference, changing requirement, lack of communication between

the parties and unforeseen site conditions will give rise to disputes will can eventually lead to arbitration and litigation if not solve amicably.

4. **Arbitration:-** Client –related, contract relationship related factors will escalate disputes to be settled by arbitration process.
5. **Total abandonment:-** Client – related, labour –related, contract related, contract relationship related and external factors will aggravate dispute which will eventually lead to litigated if not curbed. The parties however will only engage in litigation as a last resort.
6. **Litigation:-**Client- related, consultant – related, labour –related, contract – related and external factors will contribute to the total abandonment of the project.

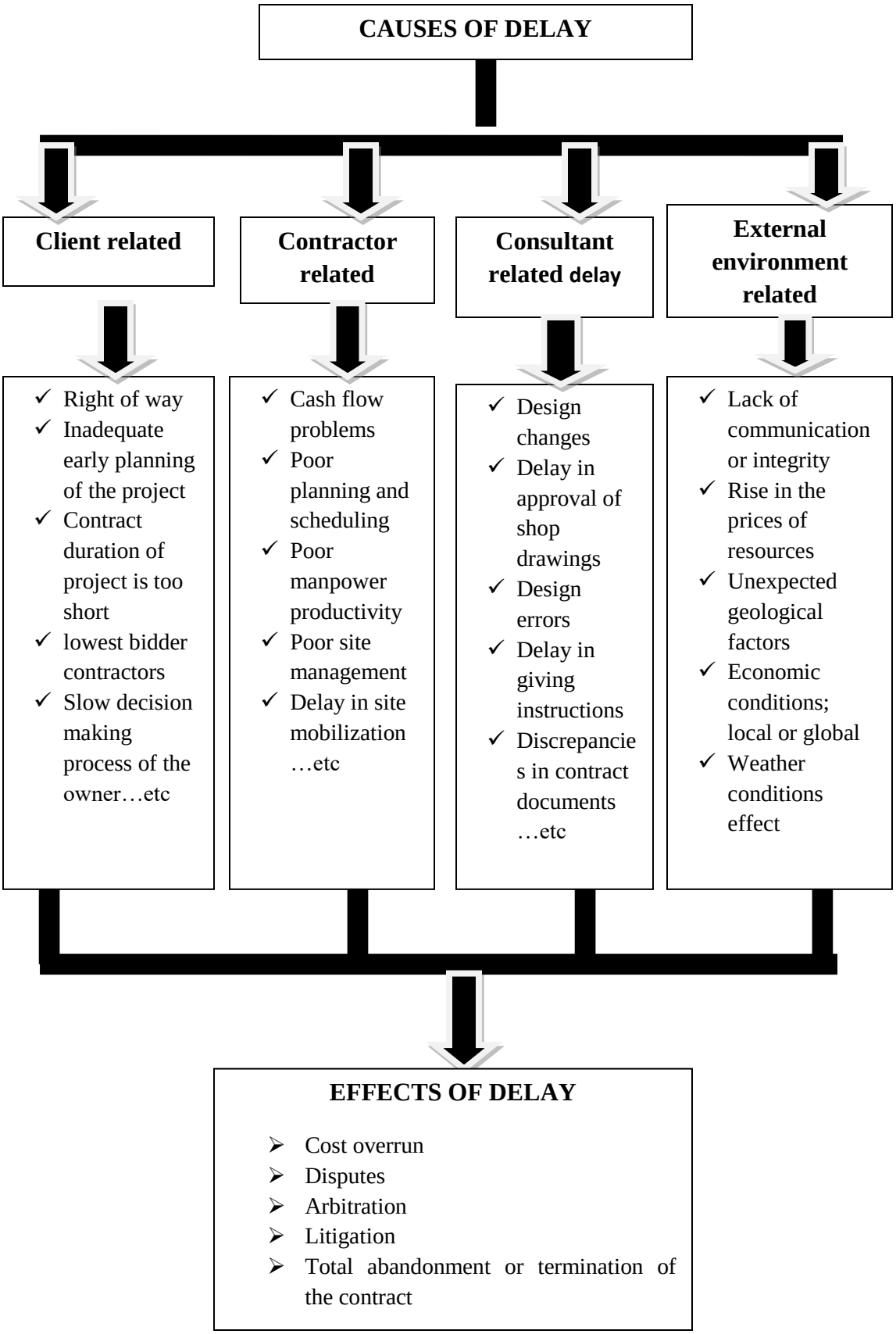
Li, Love and Dawe (2000) argue that when delay occurs there are three possible situations that a project manager may be confronted with additional costs, a decline in quality and rework. Yet, a project manager is often faced with the following options: either prescribes overtime work and/or injects additional resources, in order to meet the project's schedule. While injecting additional resources can significantly increase project costs, prolonged overtime work may cause declines in productivity and performance, which may also generate rework. (Li H, 2000)

Scott (1993) admitted that some delays have much greater financial implications on the completion cost, though it’s dependent on who is seen to be responsible for such delays. The effects therefore range from an agreed extension to the project time with payment of the Contractor’s overhead costs, to the deduction of liquidated and ascertained damages by the contractor (Scott S, 1993).

2.2.6 Conceptual framework

A conceptual frame work is an analytical tool with many variations and contexts. It is used to make conceptual distinctions and organize ideas. Many conceptual frameworks are presented through visual or graphical. The following figure 1.1 has conceptualized the causes and effects of delay in construction projects.

Fig. 2.1 Conceptual frame work of causes and effects of delay



CHAPTER THREE

3 METHODOLOGY

The aim of this section is to present and explain the procedures adopted by the researcher in carrying out the study. The objective of this thesis is to analyze causes and effects of delay in Addis Ababa Condominium housing asphalt road construction projects and makes conclusions and recommendations based on the findings. The research strategy and design to be followed towards this end are discussed as follows.

3.1 Description of the study area

The Addis Ababa City Road Authority is one of the Public Organization under the City Administration engaged to construct, maintain and administer the road works in Addis Ababa by the city administration. The mission of the Authority is Building Asphalt roads, Gravel Access Roads, Coble Stone pavement Roads, Drainages, Bridges and concrete roads and making that for residents of Addis Ababa remarkably enhance the regular activities, thereof using hi-tech and low cost being constructed by contractors and own force at improving level on time available for public service.

Currently, AACRA administer more than 294 road and road related projects. The authority performs its duty by contract out or own force operation. Out of 294 projects half /147/ projects are handled and intended to be takeover by contractor's, while the rest 147 projects are performed by his internal own force capacity. More than 59 asphalt and cobble stone paved road projects are planned in the 2010 FBY to construct in condominium housing different areas of the city, (Athourtiy, 2017)

3.2 Research design

Creswell J.W (2009) gives explanation about Research designs /plan/proposal to conduct research/ as plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis and the three types of designs are: qualitative, quantitative, and mixed methods. (Creswell, 2009)

This study follows quantitative survey design /plan/ where a sample of condominium housing asphalt road projects is studied using questioner to determine causes and effects of delay characteristics, and it is then inferred that the population has the same characteristics.

3.3 Population and sampling design

3.3.1 Population

The population of projects sample was condominium asphalt roads within the geographical boundaries of the Addis Ababa city. A purposive sampling is used to select the projects that are to be investigated for this study out of the population. To do this it is important to quantify the total number of condominium hosing asphalt projects, which are under construction in the city of Addis Ababa.

According to housing road construction contract administration directorate of the Addis Ababa City Road Authority (AACRA) 2010 Budget Year annual plan, there are 59 asphalt and cobble road projects out of which 32 are asphalt road projects. The target population included Only 11 housing asphalt road projects that were awarded to contractors. Based on the annual plan of the organization 6 of them are completed and the rest 5 are in different level of accomplishment. (Athourtiy, 2017)

3.3.2 Sampling design

1. Sampling techniques

According to Singh Y.K (2006), the study of the total population is not possible and it is also impracticable. The practical limitation: cost, time and other factors which are usually operative in the situation stand in the way of studying the total population. The concept of sampling has been introduced with a view to making the research findings economical and accurate. (Singh, 2006)

Therefore the researcher employed non-probability sampling method, specifically purposive sampling technique. The intention of using purposive method is to select participants from those directly in touch with the activities. Thus the participants that are included in this research were selected based on the following inclusion criteria's.

- The participant must be registered GC of Grade 1, Consultants and project owners.
- Based on the questioner technicality, individual participants must be professional engineers, project manager, and architects.
- The participants should be those which are involved in the construction of condominium housing asphalt road projects.
- The participant should have experience in contract management at condominium housing asphalt road construction projects

In order to ensure the reliability of the data, the researcher will carefully examine the trustworthiness of different data sources including respondents and various forms of

documents with a view to increasing the validity of the research findings and interpretations using triangulation method.

2. Sample size

The questionnaire was distributed to engineers who are located under contract administration departments of each construction stakeholders (contractors, consultants, and employer) who directly participated in the construction of the selected housing asphalt road projects.

Eight engineers' which accounts 19% under the Hosing Road Construction contract Administration Directorate of the employer, 18 engineers under the contract administration department of the six contractor's which counts 42.9% of the total respondents involved in the construction process of the selected roads for this study and 16 engineers under contract administration department of the four consultant's. The respondents' from consultants take the 38.1% of the total share.

. Table 3.1 Sample Selection

No	Description	Total number of	Total Questioner distributed	
			No	%
1	Awarded Condominium housing asphalt projects	11	-	
2	Contractors	7	18	42.9
3	consultant	4	16	38.1
4	Client (AACRA's Hosing Road Construction contract Administration Directorate)	1	8	19
		Total	**42**	**100**

The researcher believed that these are the only respondents who know about delay cause and effect factors for the road construction projects as they were involved in the

construction process of the understudied projects and decided to distribute the questionnaire to all of these engineers.

Since the questioner designed is too technical and needs some analytical skills the targeted respondents comprised of, counter parts and follow up teams of the Addis Ababa City Road Authority's housing road construction contract administration directorate, project managers and site engineers of contractors and resident engineers and project engineers of consultants. Therefore, the questionnaire was distributed for a total of 42 respondents who know the area or subject matter very well.

3.4 Source of data collection

As suggested by many scholars, the study relied on both qualitative and quantitative methods of data collection. A questionnaire has been designed and distributed to the selected samples of the population. Progress reports, contract documents and annual plan of the projects in consideration have been analyzed and reviewed to extract some data of each projects regarding document analysis or desk study.

3.4.1 Primary source

The primary data, which refers to the field data, were obtained through the use of a suitable close-ended questionnaires developed from the initial identification of likely causes and effects of delay on condominium housing asphalt road projects in Addis Ababa.

Questioner design

To achieve the aims of the research defined in the previous section, a field study based on the literature review carried out. The survey done through a questionnaire exercised to

evaluate the perception of parties involve in the construction process on comparative significance of causes and effects of delay in Addis Ababa housing asphalt road construction projects.

The questionnaire included three sections. The first section contained general questions about the Company, respondent and project profile and project description. Section two of the questionnaire concentrated on questions about hypothesized factors that contribute to causes of delays in condominium housing asphalt road projects. The participants in the survey were asked to point out their answer to the frequency of occurrence and degree of severity on 61 well identified factors causing delay in construction projects. These were distributed into four groups of factors:

Group 1: included 17 factors related to clients.

Group 2: included 21 factors related to contractors.

Group 3: included 11 factors related to consultants.

Group 4: included 12 factors related to external circumstances.

The third section of the questionnaire composed of the effects of delay on the construction of housing asphalt road projects. From the literature review, six effects of delay were specified. These are time overrun, cost overrun, disagreement between parties, arbitration, litigation and abandonment of the project.

The respondents' feedback was designed to be organized in the form of a Likert scale; the numbers assigned to the agreement or degree of influence (1, 2, 3, 4, 5) have been used. The participant who answers the questions will mark a figure from 1 to 5 depending on the frequency of occurrence and the severity of the cause of delay or effect on asphalt road construction project.

Table 3.2: Data measurement

Causes of delay factors	**Chances of occurrence**	Very high	High	Medium	Low	Very low
	scale	5	4	3	2	1
Effects of delay factors	**Chances of occurrence**	Always	Mostly	Sometimes	Seldom	Never
	scale	5	4	3	2	1

3.4.2 Secondary source

The secondary data were collected using document analysis including progress reports, contract document and annual plan. In achieving the objectives of this study, the information regarding causes of delays, effects of delays, and methods of minimizing delays were obtained from various sources i.e., international journal, international conference materials, and published books. Based on previous literature were identified sixty one factors that contributed to the causes of delays, and six factors that affect delays in road construction.

3.5 Data analysis technique

The procedure used in analyzing of data aimed at establishing the importance of the various factors that contribute to causes and relative degree of occurrence of effects of delay. There are three steps used in analyzing the data: the first one is calculating the frequency, severity and importance index to ranking of delay factors in each category, secondly ranking of the most significant causes of delay factors and finally based on their mean score (MS), shows the frequency of occurrence of the effects of construction delays on condominium housing asphalt road projects delivery revealed by the survey study.

Microsoft office Excel 2007 and statistical software called Statistics Package for Social Science (SPSS Version 16) are used to undertake the calculations.

Sambasivan & Soon (2007) and Ramanathan, et al. (2012) used relative importance Index method to rank causes and effects of delay in their research. The same method was adopted in this study for analysis of the research objective 2 and 3 within various groups (consultants, clients and contractors).

Therefore, the relative importance index of each factor rated by clients, contractors and consultant is calculated by the following formula, (Ramanathan, 2012).

Relative Importance Index (RII) = $\frac{\sum w}{A \times N}$……..……..……Equation (1)

Where:

w = is the weighting given to each factor by the respondents and range from 1 to 5 (for Section B: Very low, Low, Medium, High and Very high contributing and for section C: Never, Seldom, Sometimes, Mostly and Always respectively)

A = is the highest rating (i.e. in this case 5) and

N = is the total number of participants in the survey

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CHAPTER FOUR

4 DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter describes the results and discussion of desk study and questionnaire survey

Regarding causes and effects of condominium housing asphalt road projects in Addis Ababa from the three major construction contract role players namely contractors, consultants and client point of view.

From the desk study eleven condominium housing asphalt road construction projects in Addis Ababa were surveyed. During the desk study the contract time during signing of the contract, time extension actual and actual completion time at completion of the project were investigated. These help to know whether there is delay exist or not, and to investigate how the actual time at completion deviates from the original contract period.

4.2 Questionnaire Survey Response

Out of a total of 42 questionnaires 18 were distributed to Contractors, 16 to Consultants and the remaining 8 to staffs of the employer. The general response rate for contractors, owners and consultants was 85 % and the total number of respondents for the three stakeholders was 36 out of 42 respondents. The response rate of contractors was 77.8% (15), for the owner 100 % (8) and 81.3% (13) for consultants.

Table 4.1 Respondent Rate

No	Respondent	Total questionnaire Distributed		Total questionnaire Responded	
		No	(%)	No	Response rate (%)
1	Client	8	19	8	100
2	Contractor	18	42.9	15	83.3
3	consultant	16	38.1	13	81.3
	Total	42	100	36	85.7

4.3 Statistics of Respondents

4.3.1 Company profile

Since the AACRA is the one responsible for the road sector of the city, it is the only client included under the study. Four consultants and six contractors have been investigated for the survey.

The client, 1 contractor and 2 consultants has more than 15 year of experience the rest contractors and consultants have an experience more than 5 years on the construction industry.

The employer, 2 contractors and 4 consultants companies have been involved in more than 15 road projects. Moreover, three of the contractors have been involved on less than five road projects.

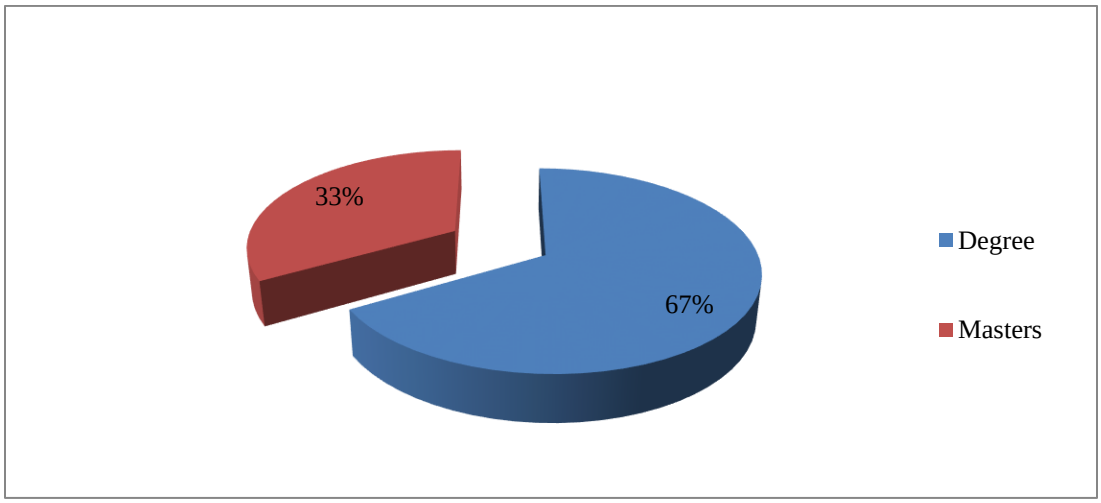
Except the client, all the companies have been involved in less than 5 condominium asphalt road projects.

4.3.2 Respondent profile

1. Academic qualification of respondents

The academic qualification of the respondents is shown in Figure 4.1. Of the 36 respondents (67%) which constitute the highest are with B.Sc. degrees, and 33% having master degrees.

Fig. 4.1 Academic qualifications of respondents

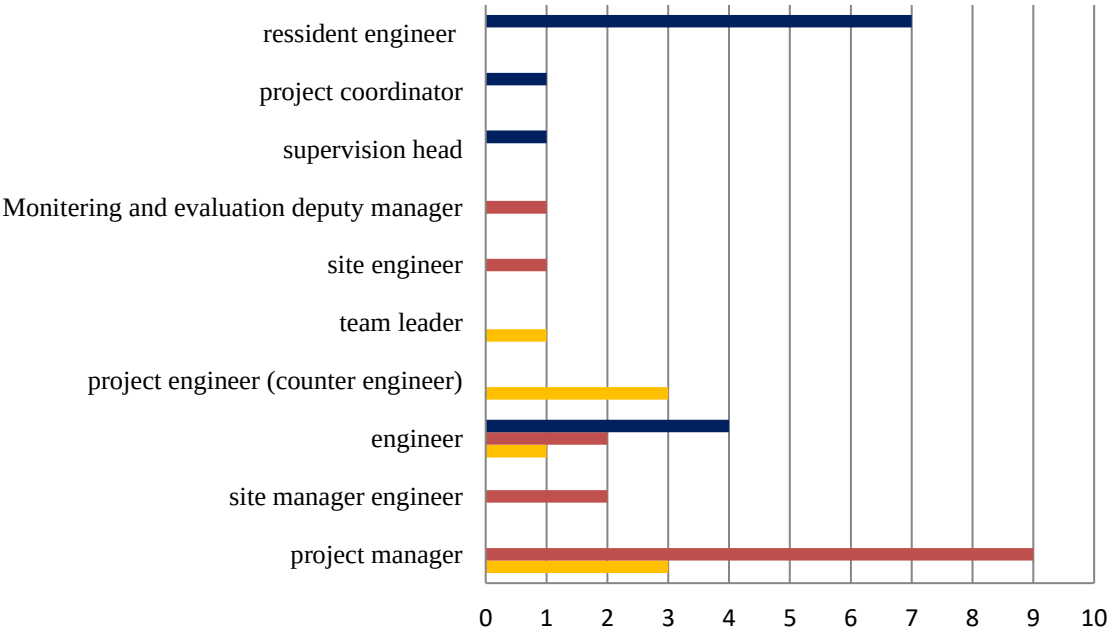


It's therefore believe that the data provided are genuine and can be relied upon, since the majority of the respondents are those with B.Sc. and the rest have master's degree.

2. Respondents position

The designation or position of the respondents shows a relatively wider variety of professionals which are relevant to the condominium housing asphalt road construction delay analysis. The respondents have been assigned as project manager, site manager /engineer/, engineer, project engineer (counter engineer), team leader, site engineer, monitoring and evaluation deputy manager, supervision head, project coordinator and resident engineer.

Fig. 4.2 Summary of respondents position



	project manager	site manager engineer	engineer	project engineer (counter engineer)	team leader	site engineer	Monitering and evaluation deputy manager	supervision head	project coordinator	ressident engineer
consultant			4					1	1	7
contractor	9	2	2			1	1			
client	3		1	3	1					

The above Fig. 4.2 shows that 13.3 % (2) of contracting companies respondents were site engineers, 60 % (9) were projects managers and 13.3 % (2) were engineers. It has been found that 37.5 % (3) of clients respondents were site project manager and 37.5 % (3) were project engineer (counter engineer).

Besides 53.8.4 % (7) of the consultants companies respondents were resident engineers, 30.8 % (4) were engineers and both supervision head and project coordinator for each of them comprises 7.7 % (1).

Generally, out of 36 respondents for the three parties, 33.33 % (12) of the respondents were project manager, 19.4 % (7) equal amount of engineer and resident engineer and 8.3% (3) were project or counter engineers counts the highest share of the remaining positions.

From the above analysis it can be inferred that the combination of this professional give ample response to the information been sought which further validate the outcome of the analysis. The designation of the respondents shows a relatively wider variety of professionals which are relevant to the construction delay analysis.

3. Experience of Respondents

Table 4.4 depicts that 25 % (9) of the respondents have experience between 1to 5 years at construction area and 44.4 % (16) of the respondents experience between 5 to 10 years, 25 % (9) of respondents have experience from 10 to 15 years, and 5.6 % (5.6) who have experience more than 15 years.

Table 4.2 Years of experience of the respondents

Years of Experience	Client	Contractor	Consultant	Total
1 – 5 years	6	2	1	9
5 – 10 years	2	8	6	16
10 – 15 years		4	5	9
>15 years		1	1	2
Total	8	15	13	36

From the above analysis it can be concluded that the respondents have enough experience about the proposed closed ended questioner regarding causes and effects of delay in the construction industry in return to reliable on their opinion.

4.4 Analysis of Causes of Delay

According to the three major stakeholders of Consulting firm, Employer and Contractor respondent's response for all condominium housing asphalt road project delay factors responses indicated under the questioner has been analyzed and; subsequently, ranking and analysis has been made; as indicated under the following sections.

4.4.1 Analysis of factors causing delay under each category

1. Client Related Factors

Client is one of the categories that cause delay on the construction of Addis Ababa condominium housing asphalt road projects. Under this category, 17 delay factors were found as main cause for the condominium housing asphalt projects of the city. These factors were ranked by the respondents according to the degree each factor have on the project delay. Table 4.3 presents the result of the analysis of the factors under this category by each group of respondents (client, contractor and client).

Table 4.3 Results of client related factors

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1. Design changes by the owner	0.650	6	0.653	7	0.538	12	0.611	7
2. Low performance of the lowest bidder contractors in the tendering system	0.875	1	0.653	7	0.723	4	0.728	4
3. Changes in the scope/extent/ of the project	0.725	5	0.613	12	0.600	8	0.633	6
4. Delay in progress payments by the owner	0.475	11	0.560	14	0.523	13	0.528	12
5. Owners' lack of experience in construction	0.350	17	0.413	17	0.462	15	0.417	17
6. Poor qualification of supervision staff of the owner's engineer	0.425	12	0.640	10	0.523	13	0.550	11

7. Uncooperative owner with the contractor or consultant	0.425	12	0.440	15	0.600	8	0.494	16
8. Lack of coordination with contractors	0.525	8	0.627	11	0.646	6	0.611	7
9. Inadequate early planning of the project	0.875	1	0.787	2	0.785	2	0.806	2
10. Breach or modification of contract by the owner	0.425	12	0.440	15	0.692	5	0.528	12
11. Delay in the approval of the contractor submittals to the owner	0.525	8	0.653	7	0.554	11	0.589	9
12. insufficient available utilities on site	0.425	12	0.667	6	0.431	16	0.528	12
13. Contract duration to construction of project is too short	0.775	3	0.693	3	0.785	2	0.744	3
14. Slow decision making process of the owner	0.650	6	0.680	4	0.646	6	0.661	5
15. Mistakes in soil investigation	0.425	12	0.680	4	0.415	17	0.528	12
16. Delay in delivering the site to the contractor	0.775	3	0.840	1	0.846	1	0.828	1
17. Difficulties in obtaining work permits from the authorities	0.500	10	0.600	13	0.569	10	0.567	10

According to the analysis result, ‘delay in delivering the site to the contractor or right of way problem’ is the most significant factor for condominium housing asphalt road projects delay with an average relative importance index score of 0.828 followed by inadequate early planning of the project from both contractor and consultant point of view. This result indicates the high importance of delivering the site on time to complete the project on time. The right of way problem creates disputes between the parties of project, and then the time of completion will be affected even more. This agreement of opinions between contractors and owners proves the importance of these factors in projects delay.

However, from the client point of view inadequate early planning of the project and low performance of the lowest bidder contractors in the tendering system are the most equally weighted delay factors.

Based on the RII on table below, it can be generalized that these category have been highly weighted by all groups of respondents. Delay in delivering the site to the contractor or right of way, Inadequate early planning of the project and contract duration to construction of project is too short are the top three factors that causes delay under the client related factors category from all respondents view.

2. Contractor Related Factors

Out of 21 contractors related delay factors category, 'cash flow problems faced by the contractor' which implies indirectly the capacity of the contractors is ranked as the most frequently happen factor to contribute for delay in condominium housing asphalt road construction projects under AACRA with the average relative importance index value of (RII=0.844). Any shortage of cash for the contractor will cause many problems such as slow progress and work decline in productivity. Also the contractors will not be able to purchase the necessary equipment for construction work. The client pays advance payment for the contractor before the project started based on the contract agreement. So the financial problem is due to contractor's mismanagement.

Poor planning and scheduling of the project by the contractor is also one of the potential cause of project delay, because if the contractors fail to plan their work properly it will affect the project original contract completion time and it will be a big loss for contractor, client and end users or the community.

It can be noticed from the analysis result table 4.4 the difference between the views of contractors, consultants and owners on this particular factor or cause of delay. The respondents from the consultant's side ranked "Poor manpower productivity" as the third most important and most frequently happening factor to contribute for delay in

condominium housing asphalt road construction projects under AACRA with the relative importance index value of (RII=0.8). Contractor and client respondents were ranked this factor as the fifth and eighth respectively most important factor to contribute for delay understudied. This factor is out of the become the third most important factors to contribute for delay in road construction projects based on the average relative importance index of (Av.RII=0.728).

Table 4.4 Results of contractor related factors

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1. Cash flow problems faced by the contractor	0.825	1	0.893	1	0.800	1	0.844	1
2. Slow preparation of change order requests by the contractor	0.675	5	0.613	13	0.615	9	0.628	10
3. Poor planning and scheduling of the project by the contractor	0.775	2	0.773	2	0.800	1	0.783	2
4. Poor site management and supervision by the contractor	0.750	3	0.720	8	0.708	4	0.722	4
5. Improper construction methods implemented by the contractor	0.675	5	0.773	2	0.538	15	0.667	7
6. Material quality problems	0.550	13	0.707	10	0.523	17	0.606	12
7. Delay in site mobilization	0.600	8	0.720	8	0.708	4	0.689	5
8. Shortage of construction material	0.525	15	0.747	5	0.615	9	0.650	9
9. Non availability of equipment and failure	0.525	15	0.760	4	0.646	6	0.667	7
10. Delay in preparation of shop drawings	0.500	17	0.547	15	0.569	14	0.544	17
11. Delay in material supply	0.650	7	0.747	5	0.631	8	0.683	6
12. Difficulties in obtaining work permits from the authorities concerned (delay due to local authorities)	0.600	8	0.627	12	0.646	6	0.628	10
13. Poor manpower productivity	0.600	8	0.747	5	0.785	3	0.728	3

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank		RII	Rank	RII
14. Shortage of qualified engineers (Poor qualification, skills and experience of the contractor's technical staff)	0.700	4	0.533	17	0.615	9	0.600	13
15. Delay due to sub-contractor work	0.475	18	0.613	13	0.538	15	0.556	15
16. Poor communication by the contractor with the parties involved in the project	0.575	11	0.640	11	0.508	18	0.578	14
17. Delay in the preparation of contractor document submissions	0.475	18	0.440	20	0.585	12	0.500	20
18. Mistakes and rework due to errors during construction by the contractor	0.550	13	0.533	17	0.585	12	0.556	15
19. Delay in test samples of materials	0.475	18	0.547	15	0.492	19	0.511	18
20. Too much working load by the contractor	0.425	21	0.387	21	0.462	21	0.422	21
21. Technical problems in project site by the contractor	0.575	11	0.480	19	0.492	19	0.506	19

3. Consultant Related Factors

The result of causes of consultant related delay factors analysis shows that 'design changes' and 'design errors made by the designers due to unfamiliarity with local conditions and environment' is the first and second factor with the views of the client and consultants. However, it is third and fourth factor for the contractor.

Table 4.5 Results of consultant related factors

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1. Design changes	0.700	1	0.773	3	0.600	2	0.694	1
2. Non availability of consultant's staff on site	0.575	7	0.667	7	0.523	5	0.594	6
3. Deficiency in drawings	0.525	10	0.573	10	0.446	10	0.517	11

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
4. Poor qualification of supervision staff of the consultant engineer	0.575	7	0.720	4	0.431	11	0.583	9
5. consultant's staff not available on site at the correct time	0.450	11	0.787	2	0.462	9	0.594	6
6. Delay in giving instructions	0.675	3	0.707	6	0.508	7	0.628	4
7. Delay in approval of shop drawings	0.600	6	0.800	1	0.569	4	0.672	2
8. Design errors made by the designers due to unfamiliarity with local conditions and environment	0.700	1	0.720	4	0.600	2	0.672	2
9. Poor communication and coordination by the consultant engineer	0.625	4	0.640	8	0.508	7	0.589	8
10. Discrepancies in contract documents	0.575	7	0.600	9	0.615	1	0.600	5
11. Errors in Design and contract documents	0.625	4	0.573	10	0.523	5	0.567	10

As shown on the above table, the most important and highly ranked consultant related delay causes in the construction of condominium housing asphalt road projects, are design changes (Av.RII=0.694), equally ranked factors of delay in approval of shop drawings design errors made by the designers due to unfamiliarity with local conditions and environment & design errors made by the designers due to unfamiliarity with local conditions and environment (Av.RII=0.672), delay in giving instructions (Av.RII=0.628), and discrepancies in contract documents (Av.RII=0.591).

4. Delays Due to External Factors

From these twelve factors, as it can be seen from table 4.6 below Lack of communication or integrity between different parties is the first factor under this group of factors. This is because there are many external parties which are engaged in clearing the right of way of

the roads to be constructed like Addis Ababa condominium housing agency, ethio telecom, EEPCo and AWSA.

Unexpected geological factors, rise in the prices of resources (materials, labour and equipment) and economic conditions; local or global like devaluation, inflation/ price fluctuation are also of the top three factors for the average ranking by all the respondents. These factors are beyond the control of all the parties involved in the condominium housing asphalt road projects. The factor war/conflict or public enemy is the least one for all groups of respondents, which shows that these factors are contributing the least project delay.

Table 4.6 Results of delay due to external factors

Factors	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1. Conflict/War/Public Enemy	0.325	11	0.440	11	0.354	12	0.383	12
2. Government change of regulations and bureaucracy	0.400	10	0.480	10	0.415	10	0.439	10
3. Official and non-official holidays	0.250	12	0.387	12	0.600	8	0.433	11
4. Problems with local community	0.475	9	0.587	8	0.738	4	0.617	8
5. Economic conditions; local or global	0.675	4	0.680	5	0.738	4	0.700	4
6. Lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions	0.825	1	0.640	6	0.908	1	0.778	1
7. Rise in the prices of resources (materials, labour and equipment)	0.750	3	0.760	1	0.785	3	0.767	2
8. Delays in resolving contractual issues	0.575	7	0.640	6	0.662	6	0.633	7
9. Conflict between contractor, owner and consultant	0.500	8	0.520	9	0.385	11	0.467	9
10. Weather conditions effect on construction activities	0.650	5	0.720	4	0.662	6	0.683	5
11. Unforeseen site conditions	0.600	6	0.747	2	0.569	9	0.650	6
12. Unexpected geological factors	0.775	2	0.733	3	0.800	2	0.767	2

4.4.2 Ranking of the Most Significant Factors (Top Ten Delay Causes)

In Table 4.7 below, as ranked by relative importance index of the three stakeholders' respondent, out of 61 factors causing delay in Addis Ababa condominium housing asphalt road construction project the top ten delay causes were presented and all the 61 factors were summarized and presented in (Appendix B).

. Table 4.7 Ranking of the top ten important factors from overall results

Factors	Response rate					Total	Σw	Mean	RII	Rank	category
	1	2	3	4	5						
1. Cash flow problems faced by the contractor			4	20	12	36	152	4.222	0.844	1	contractor
2. Delay in delivering the site to the contractor		3	6	10	17	36	149	4.139	0.828	2	client
3. Inadequate early planning of the project			9	17	10	36	145	4.028	0.806	3	client
4. Poor planning and scheduling of the project by the contractor		4	7	13	12	36	141	3.917	0.783	4	contractor
5. Lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions		5	6	13	12	36	140	3.889	0.778	5	external
6. Rise in the prices of resources (materials, labour and equipment)		5	7	13	11	36	138	3.833	0.767	6	external
7. Unexpected geological factors	1	1	12	11	11	36	138	3.833	0.767	6	external
8. Contract duration to construction of project is too short	1	5	8	11	11	36	134	3.722	0.744	8	client
9. Low performance of the lowest bidder contractors in the tendering system	2	5	6	14	9	36	131	3.639	0.728	9	client
10. Poor manpower productivity	1	5	10	10	10	36	131	3.639	0.728	9	contractor

Cash flow problems faced by the contractor with RII=0.844 are suggested as the most important factor causing delay on building construction projects. This is closely followed by delay in delivering the site (right off way problem) to the contractor of client related factor with RII=0.828.

Inadequate early planning of the project by AACRA, poor planning and scheduling of the project by the contractor and Lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions) external factors with RII=0.806, 0.783 and 0.778 by the Consultants also ranked 3rd, 4th and 5th potential causes of housing asphalt road construction projects delay factors respectively. Besides, lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions), rise in the prices of resources (materials, labour and equipment), unexpected geological factors and shortness of contract duration time are ranked 6th and 8th.

Low performance of the lowest bidder contractors in the tendering system of the client and contractors' Poor manpower productivity of the staff which is an equal level potential cause for delay ranked 9th with RII=0.728 and followed by Poor site management and supervision by the contractor with RII=0.722 has lots of effects on condominium housing asphalt road construction projects.

4.4.3 Analysis of General groups of causes of delay

On the previous section of this chapter, the analysis of each single factor under each four categories have been analysed and presented. Now on this section of the chapter, the analysis of the cumulative effect of the each factor will be analyzed by calculating the relative importance index for each factors of the four main categories as presented on

table 4.8 below. Then each category is ranked according to the value of RII for each group of respondents.

Table 4.8 cumulative results of all respondents on groups of cause of delay

category	client		contractor		consultant		Average	
	RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
Client related factors	0.578	3	0.626	3	0.608	3	0.609	4
Contractor related factors	0.595	2	0.645	2	0.612	2	0.622	1
Consultant related factors	0.602	1	0.687	1	0.526	4	0.610	2
External environment factors	0.567	4	0.611	4	0.635	1	0.610	2

According to the result, the first category that causes delay on condominium housing asphalt road construction projects in Addis Ababa is the contractor related factor. This factor was ranked equally 2nd by all construction role players (client, contractor and the consultant). The weight given for the consultant related and external environment factors are equally important to rank the second causes of categories.

4.5 Analysis of Effects of Delay

As it has been done on the analysis of the causes of delay above here, also the same procedure is used to analyze the data and find out the relative importance index for the occurrence of the hypothesized effects of delay on the construction of Addis Ababa city condominium housing asphalt road projects. Even tough on third section of the questioner there were an open ended question, which the respondents have to sight if there are some effects of delay other than pre hypothesized on the questioner and weight them accordingly, no respondent have attended them.

In this respect the respondents asked to rate their agreement on the effect of delay using five points scale (never, seldom, sometimes, always and mostly) having a score from 1 to 5 respectively. Table 4.8 below presents the findings of the analysis with the relative important index of each factor and the respective ranks.

Table 4.9 Results of frequency of effects of delay

Effects	client		contractor		consultant		Average	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1. Cost overrun	0.725	1	0.920	1	0.707	1	0.839	1
2. Dispute	0.650	2	0.733	2	0.533	2	0.672	2
3. Arbitration	0.275	5	0.547	3	0.387	3	0.450	3
4. litigation	0.300	4	0.480	4	0.320	5	0.400	5
5. Total Abandonment (contract termination)	0.350	3	0.453	5	0.347	4	0.411	4

Results from Table 4.9 shows that cost overrun or increase in final cost of the project ranked the highest with Av.RII of 0.839. From the desk study, the accomplishment of condominium asphalt road projects reveals that out of eleven projects five of them encountered cost overruns. The following table 4.9 shows condominium asphalt road projects that are affected by cost overrun.

Table 4.10 Cost overrun of Addis Ababa condominium housing asphalt road projects

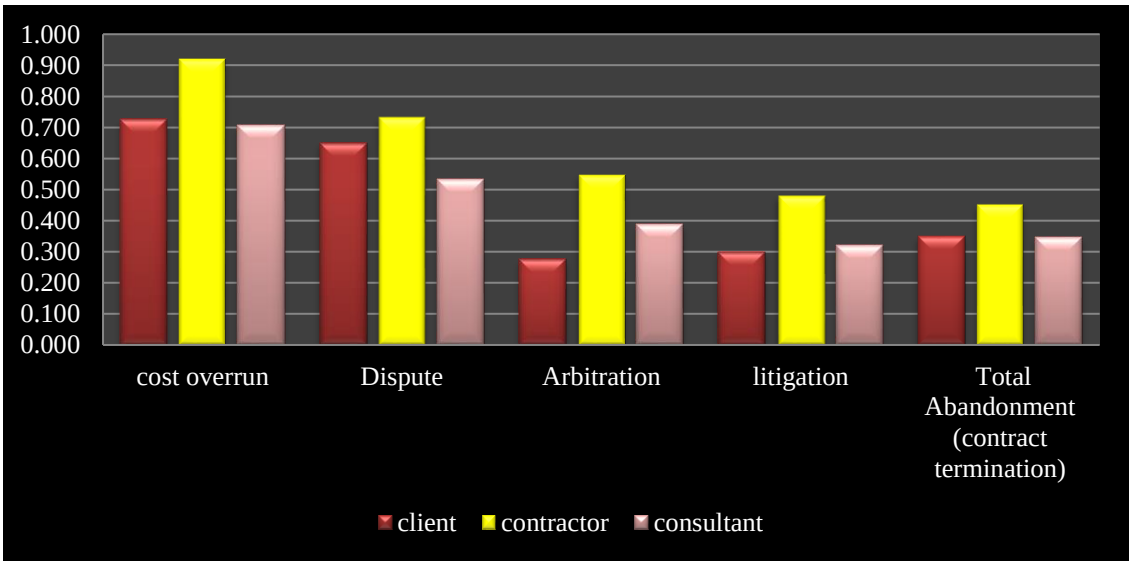
No	Condominium Asphalt Project Name	Original contract Price in ETB	Revised Contract price in ETB	Additional cost in ETB	Rate of Cost Overrun (%)
1	Genet Menafesha condominium	131,954,234	163,193,359	31,239,125	24%
2	Karakore condominium	69,103,350	134,372,551	65,269,202	94%
3	kilinto condominium	119,669,285	43,754,927	24,085,642	20%
4	Ehl Ngd condominium	158,984,582	193,997,454	35,012,871	22%
5	Tulu dimtu lot 5,6 and 7 condominum asphalt road and canal construction	193,071,330	267,309,719	74,238,389	38%

From the above table we can see that nearly half of studied condominium asphalt road construction projects exceed from the estimated cost or original contract price. Though there may be various reasons for such divergence that but the major one were design related problems.

Disputes among parties refer to the disagreement between different parties in the construction project is ranked third with AV.RII value of 0.768. Arbitration and litigation were ranked fourth and sixth with Av.RII values of 0.4500 and 0.400 respectively.

There is a close interrelation among these three effects. Dispute among parties involved can induce litigation and arbitration and if the decision of the arbitration alternative dispute resolution mechanism is not acceptable to either of the parties involved, this can lead to litigation which can terminate the progress of the work and takes long time to get court decision. Abandonment refers to stopping every work or suspending the project for long time and termination of the contract of the project was ranked last with Av.RII values and 0.577.

Fig. 4.3 Effects of delay



From the figure 4.3 above, it can be clearly seen how similar the weight given and ranked by the three agents (clients, consultants and contractors) regarding time overrun, cost overrun and dispute type effects of delay in condominium housing asphalt road projects. In addition, the contractors' and clients' weight for the time and cost overrun is seen as the highest RII of all. This implies that both contractors and client are highly affected by the time and cost overrun effect of delay.

CHAPTER FIFE

5 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

This chapter includes the conclusions and recommendations that may help in solving the problem of delay at construction in Addis Ababa condominium housing asphalt road projects. The first objective of this study was to to identify and analyze the major factor that causes delay in condominium housing asphalt road construction projects delivery in Addis Ababa. The second and third objectives was to investigate and rank the identified causes in their order of significance and to identify and rank the effect of condominium asphalt road construction delay on stakeholders based on their frequency.

Desk study was used to identify the existence and extent of time delay (overrun) on condominium asphalt road construction projects in Addis Ababa. Using questionnaire survey, targeted on the main stakeholders in the sector, perception on 61 hypothesized causes of delays and 6 effects of delay are identified. These 61 causes of delay are grouped under four major categories or sub groups; contractor related, client related, consultant related and external factor related cause of delays. The factors for each group are weighted and ranked by their relative important index (RII). By using their relative mean index, the eight main groups are weighted and ranked accordingly. Similarly the six identified effects of delay are ranked using the relative importance index (RII).

5.2 Conclusion

Based on the results of the analysis of desk study and respondents' responses the following conclusions are drawn.

1. In order to identify whether delay exist or not and evaluate the extent of time delay in Addis Ababa condominium housing asphalt road construction. Eleven out of eleven, (100%), condominium asphalt road projects investigated in the research suffered time delay in their execution. For these road construction projects, the actual time delay or overruns ranges from 2% to 243% of the contract time.
2. Out of 61 identified factors the following causes are a potential delay causes on the condominium housing asphalt projects
    A. The most common causes of housing asphalt road projects' are Cash flow problems faced by the contractor, owner's delay in delivering the site to the contractor (right of way, Inadequate early planning of the project by the client, Poor planning and scheduling of the project by the contractor and lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions i.e. AWSA, Ethio telecom, EEPCo).
    B. By recalling table 4.10: cumulative results of all respondents on groups of cause of delay; out of all the four main groups' consultant, contractor and client related factors are the top three categories from the client's perspective for causing delay on the condominium housing asphalt road projects. While contractors on the contrary made the consultant related

factors the first followed by contractor and client related factor. According to the consultants, the first contributor of delay is external/ environmental factor and the contractor and client being the second and the third. It can be inferred that contractor related factors category, is common and ranked as the second for each groups of respondents. Based on the average relative importance index of each category; the first main critical categories are contractor related and both consultant and external factors categories have equally ranked as the second.

C. Besides, it is clear that the consultant and contractor related causes of delay are found on the top three lists of two groups, which shows that most of the responsibility goes to the players of the industry i.e. for contractors and consultants.

3. The effects of delay have been ranked according to the relative importance index (RII) of their occurrence and the result have showed that the three most frequently occur effects are cost overrun, dispute and arbitration. Most of delayed condominium housing asphalt projects of the city suffer cost overrun because this factor is the first for all group of respondents.

In general, this thesis revealed that most of condominium housing asphalt road projects in Addis Ababa are exposed for delay by the fault of the one or more of construction role players of the industry and uncontrolled determinant external factors.

5.3 Recommendation

The results of the survey have identified the main causes of delay and the most frequent effect of the delay on condominium housing asphalt road construction projects in Addis

Ababa. To minimize or avoid delays concerned parties in sector and professionals are expected to work hand in hand for a common goal. Based on the findings of this thesis, the following recommendations are forwarded to the main construction role players of the industry and other parties, which have a connection to the successful completion of a project. Therefore, the following recommendations were proposed

1. **For Contractors**

   - Contractors are recommended to use advance payment properly, review cash inflow and out flow status, creating good relation with the financial institution, to make partnership or alliance with other firms in time of cash inflow shortage to avoid the financial problems. It is also advised to conduct breakeven analysis from time to time before getting the worst financial crises condition.
   - Contractors should be able to prepare clear and proper work breakdown schedules (WBS) using the appropriate scheduling techniques, which shall be approved by the consultant and the client. It is also necessary to recheck and made revision of these schedules trough out the life time of the project.
   - They should give special attention in the implementation of effective human resource management to increase productivity of manpower (human resource) system through giving intensive training and development, applying attractive compensation and benefit administration.

- Contractors should apply effective site management system for different activities of the project and strengthening their supervision level.
- Contractors should plan for mobilization of equipments and machineries and labor accurately.
- They should have procurement plan to properly deliver and utilize construction materials needed for the project based on bill of quantity (BOQ) especially that are scarce in the local markets. Hand in hand it is better to setup sufficient storage area or prepare secure required to avoid material resource damage.
- Contractors should consider the consultant as a partner and have to work for a common goal, which is completing the project on initial time and budget.

2. For Consultants

- Consultants should produce a clear, conclusive and adequately detailed design and working drawings as early as possible (prior to tender preparation).
- In order to avoid delays caused by change orders and design changes during construction, all changes should be done before the start of construction and client should clearly define its demand.
- On behalf of the client consultants are expected to take corrective action by investigating the source of delays on each task of projects and identifying the responsible party for the delay as their routine tasks.

- They have to work hard on preparation of properly and scientifically studied completion time of the project.
- To eliminating change orders or variations due to discrepancy in contract documents, consultants are advised to communicate with client and contractor directly to respond as quickly as possible design discrepancies, errors as well as omissions in design to review the contract documents thoroughly.

3. For Client

- Before tendering and/or construction starts condominium housing asphalt road projects, AACRA should make sure that the necessary requirements for delivering the site have been done to hand over the site on time as agreed on contract document to the contractors. In addition it should be loyal to its internal right of way projects rule of not tendering by confirming more than 85% of the site is cleared and ready for construction.
- AACRA expected to have strong early planning and scheduling of the design review of the road projects, revise the bid documents such as technical specifications, drawings and bill of quantities before the project construction work undertaken. Furthermore, employer has to work hard with consultants on the project feasibility study.
- Clients should have to allocate adequate and accurate contract time.
- The client should understand consequences of offering lower prices than reasonable prices that considers the actual conditions of the construction

project. Low offer would bring about delay in the construction of the project as well as reason for collapsing of contractors from the sector. It will also have adverse effect on quality and time to compensate the lower prices.

- Try to avoid frequents changes of order.
- The communication and coordination between the stake holders also have to be improved.

4. Expectations from Regulatory Bodies

- It is a mandatory to create a strong integrity and communication among Addis Ababa housing projects office, AWSA, Ethio telecom, EEPCo, and others concerned parties to minimize and eliminate delay on the construction of condominium housing asphalt road projects.
- City administration land management bureau, sub cities office and other government body's have to collaborate with AACRA in site clearance (right of way)
- Intensive advocacy should be made to create awareness among the community to believe that in one way or the other they will benefit from the success of the project.
- Government must create conducive climate of economic stability that is sufficient to inspire investors, especially in the production of construction materials to be produced from local materials to decrease price escalation as well as to replace imported goods in order to save hard currency of the country.

- Government should create opportunities for local contractors and consultants to work with international contractors and consultants to share experiences and adopt new technologies.

Reference

Abdalla M.O, ‘‘Causes of construction delay: Traditional Contracts,’’ *International Journal of Engineering, Construction and Architectural Management* , 2000, v. 5, n.3, pp. 67-73.

Abubeker Jemal, ‘‘Factors affecting time and cost overrun in road Construction projects in Addis Ababa,’’ Masters Thesis, Addis Ababa Institute of Technology, Addis Ababa University,Addis Ababa, 2015.

Addis Ababa City Roads Athourtiy, ‘‘Addis Ababa City Roads Authority Report 2009 Budget Year annual,’’ Addis Ababa, 2017, pp 1-78

Ahmed S.M, Azhar S and Castillo M, ‘‘Construction delays in Florida: An empirical study,’’ A final report: submitted to Mr. Michael Ashworth- Planning Consultants State of Florida Department of Community Affairs, USA, 1999.

Akinsulire, ‘‘Effects of Delay on construction,’’ M.Sc Thesis, University of Lagos, Department Of Building, Lagos, 2008.

Alaghbari, M.W, Razali A. Khadir, SalimAzizah and Ernawati, ‘‘The significant factors causing delay of building construction projects in Malaysia.’’ *Journal of Engineering, Construction and Architectural Management*, 2007, Vol.14, No.2, No. 8, PP. 192-206.

Al- Gahtani K. and Mohan S., ‘‘Total float management for delay analysis,’’ *Journal of Cost Engineering*, 2007, Vol. 49, No. 2, pp. 32-37.

Al-Momani, A.H. ‘‘Construction delay: a quantitative analysis,’’ *Journal of Project Management* , 2000, v.18, pp.51-59.

Ashraf Samarah D.A., ‘‘Causes and Effects of Delay in Public Construction Projects in Jordan,’’*American Journal of Engineering Research (AJER)* , 2016, v. 5 n.5, pp. 87-94.

Assaf S.A, ‘‘Causes of delay in large construction projects,’’ *International journal of project managements,* 2006, v. 24, pp. 349-357.

Bekr G.A, ‘‘Causes of Delay in Public Construction Projects in Iraq,’’ *Jordan Journal of Civil Engineering*, 2015, v. 9, n. 2, pp. 149-162.

Biruk Zegeye, ‘‘Cause and Effects of Delay on Road Construction Projects in Addis Ababa,’’ Masters Thesis, Addi Ababa University,Addis Ababa, 2008.

Chan D.M.W and Kumaraswamy. (1996). Reasons for delay in civil engineering Projects:The case of Hong Kong. *Hong Kong Institute of Engineering and Trans,*1996, v.2, n. 3, pp.1-8.

Creswell J.W, Research design: Qualitative, quantitative, and mixed methods approaches, SAGE Publications Ltd california, Vol. 3rd ed, 2009.

Flammang R., ‘‘Economic growth and economic development: Counterparts or competitors,’’ *Journal of Economic Development and Cultural Change,* 1979, pp. 47-62

Fox P.a., ‘‘Key Factors in the Future Development of the Construction Industry. In Proceedings Creating a sustainable construction industry in developing countries,’’ Proceedings of the the International Council for Building Research Studies and Documentation (CIB) Working Commission , Stellenbosch, South Africa, 2002, pp. 543-554.

Gruneberg S.L, ‘‘Construction Economics: An Introduction. London’’ Macmillan Press Ltd. ,1997.

Haseeb M.and L.X. , ‘‘Problems of projects and effects of delays in the construction industry of Pakistan,’’ 2011, *Australian Journal of Business and Management Research ,* v. 1 n. 5, pp. 41-50.

Henry T., ‘‘Construction Industry Review Committee (CIRC),’’. Construct for excellence, Hong Kong: Hong Kong Special Adminstrative Region, 2001.

Jagoro A.A, ‘‘The effects of construction delays on project delivery in the Nigerian construction industry,’’*International Journal of Project Management,* v.20, pp.593 -599, 2002.

Kaming P.F, et.al., ‘‘Factors influencing construction time and cost overruns on high-rise projects in Indonesia,’’ *Construction Management and Economics ,* 1997,v.15, pp.83-94.

Kothari C.R, Research Methodology Method and Techniques, New Age International (P) Ltd., New Delhi, 2nd ed.,2004.

KPMG India, ‘‘Study on Project Schedule and Cost Overruns.’’ New delhi,2013.

Le-Hoai L.L, ‘‘Delay and cost overruns in Vietnam large construction projects: comparison with Other Selected Countries,’’ *KSCE Journal of Civil Engineering* , 2008,v.12 , n.6, pp. 367-377.

Li H, and L.P, ‘‘Effects of overtime work and additional resources on project cost and quality,’’ 2000, *Engineering Construction and Architectural Management,* v.7 n.3, pp. 211-220.

Long, D.N.et.al, ‘‘Large Construction Projects in Developing Countries, a case study from Vietnam. Long,’’ 2004, *International Journal of Project Management ,v.22*, pp. 553-561.

Mansfield N.R, ‘‘Causes of delay and cost overruns in Nigerian construction projects,’’ *International Journal of Project Management ,* 1994, v. 12 ,n. 4, pp. 254-260.

Mezher T.M, ‘‘Causes of delays in the construction industry in Lebanon,’’ *Engineering, Construction and Architectural Management*, 1998, v. 5 , n.3, pp. 252-260.

Ndekugri I, ‘‘A legal analysis of some schedule- related disputes in construction contracts,’’ Wolverhampton, United Kingdom: Royal Institution of Chartered Surveyors,2007.

Ngowi A., ‘‘The globalization of the construction industry a review,’’ *International journal of Building and Environment ,* pp. 135-141, 2005.

Porter, M. (1998). Competitive Strategy, Free Press, New York, 1998.

Ramanathan C.S., ‘‘construction delays causing risks on time and cost a critical review,’’*Australian Journal of Construction and Econmomics and building* 2012, v.12, n.1, pp. 37-57.

Sambasivan M., ‘‘Causes and effects of delays in Malaysian construction industry,’’ 2007, *International Journal of Project management , v.25* n.5, pp. 517-526.

Scott,S, ‘‘The nature and effects of construction delay,’’ *Construction Management and Economics,*1993,v.11, pp. 358-369.

Singh Y. K., ‘‘Fundamental of research Methodology and statistics,’’New Age International publisher, New Delhi, 2006.

Siraw Yenesew,*“*Analysis of Factors Contributing to time overruns on Road Construction Projects under Addis Ababa City Administration”. MBA Thesis, Addis Ababa University, Addis Ababa.2014

Sullivan F.H., ‘‘Delays on large construction projects,’’ *International Journal of Operations and Production Management ,* 1986, v. 6, pp. 25-33.

Werku.Koshe and N, ‘‘Investigating Causes of Construction Delay in Ethiopian,’’. *Journal of Civil, Construction and Environmental Engineering* ,v. 1,n. 1, pp.18-29, 2016.

Woldegiorgis, all Africa,2016, Retrieved 12 18, 2017, from http://allafrica.com

Theodore T., ‘‘Construction delays: understanding them clearly, analyzing them correctly,’’ Elsevier Inc, ed. 2nd., united state of America, 2009.

APPENDIX A: QUESTIONNAIRE

ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

College Of Natural and Social Science

Department Of Business and Management

MBA Program in Construction Management

QUESTIONNAIRE

This questionnaire is prepared to conduct a study for the partial fulfilment of a Master's Degree in Business Administration (MBA) program entitled with "**Analysing the Causes and Effects of Delay in Addis Ababa Condominium Housing Asphalt Road Construction Projects ''.** Hence, you are kindly requested to give the necessary information for the research questions. The accuracy, honesty, and fairness of your response will have a great impact on the outcome of the research.

Aim of the questionnaire:

This questionnaire is developed to assess the views of owners, consultants, and contractors to identify important factors contributing for delay in the condominium housing road construction projects under Addis Ababa City Roads Authority.

General guidelines:

Please read each question (hypothesized factor) carefully and make a **tick (√)** or any sign under each value.

Composition of the questioner:

This questionnaire consist three sections:

Section A: Company, respondent and project profile and project description

Section B: Questions about Hypothesized factors that contribute to causes of delays

Section C: Questions about Hypothesized effect of delays

Student Name: Bayafers Abate
Advisor: Prof. Belete M.

SECTION A

COMPANY and RESPONDENT PROFILE

Please, thick one box and fill in the blanks if only for different answers.

Company Profile

1. State the name of the organization……

2. What is the type of the organization or company you are currently working at?

☐ Client ☐ Consultant

☐ Contractor ☐ Others please specify …….....….

4. State the number of year of experience the organization / company has in construction industry.

☐ 1- 5 years5 – 10 ☐ rs ☐ 10-15years ☐ > 15years

5. In how many Road projects did the company participated to date?

☐ 1 – 55 – 10 ☐ ☐ 0-15 ☐ >15

5. How many condominiums housing Asphalt Road projects does the company currently have?

☐ 1 – 2 ☐ 2 – 5 ☐ 5-10 ☐ > 10

Respondent Profile

1. Educational background

☐ Diploma ☐ BSC/BA ☐ MSC/MA ☐ PhD

2. Relevant work experience

☐ 1 – 5 years ☐ 5 – 10 years ☐ 10-15years ☐ > 15years

3. State your position in the organization/company

☐ Director ☐ Project Manager ☐ Site Manager ☐ Engineer/Designer

☐ Others please specify …….....….

SECTION B

HYPOTHESIZEDFACTORS THAT CONTRIBUTE TO CAUSES OF DELAY

Each scale represents the degree of contribution for the delays to occur:

(5) = Very high (2) = Low

(3) = Medium (1) = Very low

(4) = High contributing

Questions: How did the following related factors below contribute to causes of delays on road construction project?

No	Categories	Factors	1	2	3	4	5
1	Client - related	1. Design changes by the owner					
		2. Low performance of the lowest bidder contractors in the tendering system					
		3. Changes in the scope/extent/ of the project					
		4. Delay in progress payments by the owner					
		5. Owners' lack of experience in construction					
		6.Poor qualification of supervision staff of the owner's engineer					
		7. Uncooperative owner with the contractor or consultant					
		8. Lack of coordination with contractors					
		9. Inadequate early planning of the project					
		10. Breach or modification of contract by the owner					
		11. Delay in the approval of the contractor submittals to the owner					
		12. Insufficient available utilities on site					
		13. Contract duration to construction of project is too short					
		14. Slow decision making process of the owner					
		15. Mistakes in soil investigation					
		16. Delay in delivering the site to the contractor					
		17. Difficulties in obtaining work permits from the authorities					

No	Categories	Factors	1	2	3	4	5
2	Contractor-related	1. Cash flow problems faced by the contractor					
		2. Slow preparation of change order requests by the contractor					
		3. Poor planning and scheduling of the project by the contractor					
		4. Poor site management and supervision by the contractor					
		5. Improper construction methods implemented by the contractor					
		6. Material quality problems					
		7. Delay in site mobilization					
		8. Shortage of construction material					
		9. Non availability of equipment and failure					
		10. Delay in preparation of shop drawings					
		11. Delay in material supply					
		12. Difficulties in obtaining work permits from the authorities concerned (delay due to local authorities)					
		13. Poor manpower productivity					
		14. Shortage of qualified engineers (Poor qualification, skills and experience of the contractor's technical staff)					
		15. Delay due to sub-contractor work					
		16. Poor communication by the contractor with the parties involved in the project					
		17. Delay in the preparation of contractor document submissions					
		18. Mistakes and rework due to errors during construction by the contractor					
		19. Delay in test samples of materials					
		20. Too much working load by the contractor					
		21. Technical problems in project site by the contractor					
3	Consultant-related	1. Design changes					
		2. Non availability of consultant's staff on site					
		3. Deficiency in drawings					
		4. Poor qualification of supervision staff of the consultant engineer					
		5. consultant's staff not available on site at the correct time					
		6. Delay in giving instructions					
		7. Delay in approval of shop drawings					

		Factors	1	2	3	4	5
		8. Design errors made by the designers due to unfamiliarity with local conditions and environment					
		9. Poor communication and coordination by the consultant engineer					
		10. Discrepancies in contract documents					
		11. Errors in Design and contract documents					
	External Environment-related	1. Conflict/War/Public Enemy					
		2. Government change of regulations and bureaucracy					
		3. Official and non-official holidays					
		4. Problems with local community					
		5. Economic conditions; local or global					
		6. Lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions					
		7. Rise in the prices of resources (materials, labour and equipment)					
		8. Delays in resolving contractual issues					
		9. Conflict between contractor, owner and consultant					
		10. Weather conditions effect on construction activities					
		11. Unforeseen site conditions					
		12. Un expected geological factors					

SECTION C
HYPOTHESIZED EFFECT OF DELAYS

Each scale measures the occurrences of effects which arise from delays:

(5) = Always (4) = Mostly (3) = Sometimes (2) = Seldom (1) = Never.

Questions: What do you think are the effects that result because of delays?

No	Factors	1	2	3	4	5
1	Time Overrun					
2	Cost Overrun					
3	Dispute					
4	Arbitration					
5	Litigation					
6	Total Abandonment					
7	Others, please specify ……					

Thank you for your time and cooperation!

APPENDIX B: RANKING OF DELAY CAUSES SUMMARY

Factors	Response rate 1	2	3	4	5	Total	Σw	Mean	RII	Rank	category
11. Cash flow problems faced by the contractor			4	20	12	36	152	4.222	0.844	1	contractor
12. Delay in delivering the site to the contractor		3	6	10	17	36	149	4.139	0.828	2	client
13. Inadequate early planning of the project			9	17	10	36	145	4.028	0.806	3	client
14. Poor planning and scheduling of the project by the contractor		4	7	13	12	36	141	3.917	0.783	4	contractor
15. Lack of communication or integrity between different parties (condominium Housing agency, utility provider institutions		5	6	13	12	36	140	3.889	0.778	5	external
16. Rise in the prices of resources (materials, labour and equipment)		5	7	13	11	36	138	3.833	0.767	6	external
17. Unexpected geological factors	1	1	12	11	11	36	138	3.833	0.767	6	external
18. Contract duration to construction of project is too short	1	5	8	11	11	36	134	3.722	0.744	8	client
19. Low performance of the lowest bidder contractors in the tendering system	2	5	6	14	9	36	131	3.639	0.728	9	client
20. Poor manpower productivity	1	5	10	10	10	36	131	3.639	0.728	9	contractor
21. Poor site management and supervision by the contractor		8	4	18	6	36	130	3.611	0.722	11	contractor
22. Economic conditions; local or global		4	14	14	4	36	126	3.500	0.700	12	external
23. Design changes	1	8	9	9	9	36	125	3.472	0.694	13	consultant
24. Delay in site mobilization		4	16	12	4	36	124	3.444	0.689	14	contractor
25. Delay in material supply	1	5	10	18	2	36	123	3.417	0.683	15	contractor
26. Weather conditions effect on construction activities	1	4	16	9	6	36	123	3.417	0.683	15	external

Factors	Response rate 1	2	3	4	5	Total	Σw	Mean	RII	Rank	category
27. Delay in approval of shop drawings		9	10	12	5	36	121	3.361	0.672	17	consultant
28. Design errors made by the designers due to unfamiliarity with local conditions and environment		7	13	12	4	36	121	3.361	0.672	17	consultant
29. Non availability of equipment& failure	2	7	10	11	6	36	120	3.333	0.667	19	contractor
30. Slow decision making process of the owner	1	4	17	11	3	36	119	3.306	0.661	20	client
31. Shortage of construction material	2	9	9	10	6	36	117	3.250	0.650	21	contractor
32. Unforeseen site conditions	4	7	7	12	6	36	117	3.250	0.650	21	external
33. Changes in the scope/extent/ of the project	1	7	15	11	2	36	114	3.167	0.633	23	client
34. Delays in resolving contractual issues	1	6	17	10	2	36	114	3.167	0.633	23	external
35. Slow preparation of change order requests by the contractor		4	25	5	2	36	113	3.139	0.628	25	contractor
36. Difficulties in obtaining work permits from the authorities concerned (delay due to local authorities)	2	8	10	15	1	36	113	3.139	0.628	25	contractor
37. Delay in giving instructions	3	5	15	10	3	36	113	3.139	0.628	25	consultant
38. Design changes by the owner	3	8	13	8	4	36	110	3.056	0.611	28	client
39. Lack of coordination with contractors	2	5	18	11		36	110	3.056	0.611	28	client
40. Material quality problems	1	9	17	6	3	36	109	3.028	0.606	30	contractor
41. Shortage of qualified engineers (Poor qualification, skills and experience of the contractors technical staff)	4	7	13	9	3	36	108	3.000	0.600	31	contractor
42. Discrepancies in contract documents	2	10	11	12	1	36	108	3.000	0.600	31	consultant
43. Non availability of consultants staff on site	3	8	15	7	3	36	107	2.972	0.594	33	consultant

Factors	Response rate 1	2	3	4	5	Total	Σw	Mean	RII	Rank	category
44. consultants staff not available on site at the correct time	7	4	12	9	4	36	107	2.972	0.594	33	consultant
45. Delay in the approval of the contractor submittals to the owner	2	8	19	4	3	36	106	2.944	0.589	35	client
46. Poor communication and coordination by theconsultant engineer	4	7	13	11	1	36	106	2.944	0.589	35	consultant
47. Improper construction methods implemented by the contractor	4	7	15	8	2	36	105	2.917	0.583	37	contractor
48. Poor qualification of supervision staff of the consultant engineer	8	3	10	14	1	36	105	2.917	0.583	37	consultant
49. Poor communication by the contractor with the parties involved in the project	6	10	7	8	5	36	104	2.889	0.578	39	contractor
50. Difficulties in obtaining work permits from the authorities	6	12	5	8	5	36	102	2.833	0.567	40	client
51. Errors in Design and contract documents	4	9	13	9	1	36	102	2.833	0.567	40	consultant
52. Problems with local community	4	12	12	2	6	36	102	2.833	0.567	40	external
53. Delay due to sub-contractor work	3	11	14	7	1	36	100	2.778	0.556	43	contractor
54. Mistakes and rework due to errors during construction by the contractor	1	17	9	7	2	36	100	2.778	0.556	43	contractor
55. Poor qualification of supervision staff of the owner's engineer	5	15	6	4	6	36	99	2.750	0.550	45	client
56. Delay in preparation of shop drawings	2	15	12	5	2	36	98	2.722	0.544	46	contractor
57. Delay in progress payments by the owner	5	12	13	3	3	36	95	2.639	0.528	47	client
58. Breach or modification of contract by the owner	8	12	3	11	2	36	95	2.639	0.528	47	client
59. Insufficient available utilities on site	7	10	9	9	1	36	95	2.639	0.528	47	client

Factors	Response rate 1	2	3	4	5	Total	Σw	Mean	RII	Rank	category
60. Mistakes in soil investigation	11	6	9	5	5	36	95	2.639	0.528	47	client
61. Deficiency in drawings	5	12	13	5	1	36	93	2.583	0.517	51	consultant
62. Delay in test samples of materials	4	17	6	9		36	92	2.556	0.511	52	contractor
63. Technical problems in project site by the contractor	4	14	13	5		36	91	2.528	0.506	53	contractor
64. Delay in the preparation of contractor document submissions	5	16	8	6	1	36	90	2.500	0.500	54	contractor
65. Uncooperative owner with the contractor or consultant	7	15	6	6	2	36	89	2.472	0.494	55	client
66. Conflict between contractor, owner and consultant	8	12	12	4		36	84	2.333	0.467	56	external
67. Government change of regulations and bureaucracy	9	12	12	1	2	36	83	2.306	0.461	57	external
68. Too much working load by the contractor	11	13	9	3		36	76	2.111	0.422	58	contractor
69. Ownerslack of experience in construction	13	12	6	5		36	75	2.083	0.417	59	client
70. Conflict/War/Public Enemy	21	7	3		5	36	69	1.917	0.383	60	external
71. Official and non-official holidays	12	19	4	1		36	66	1.833	0.367	61	external